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TREATISE

ON

GYNÆCOLOGY

MEDICAL AND SURGICAL

BY

S. POZZI, M.D.

Professor Agrégé à la Faculté de Médecine; Chirurgien de l'Hôpital Lourcine-Pascal, Paris; Honorary Fellow of the American Gynæcological Society.

Translated from the French Edition under the Supervision of, and with Additions by

BROOKS H. WELLS, M.D.

Lecturer on Gynæcology at the New York Polyclinic; Fellow of the New York Obstetrical Society, and the New York Academy of Medicine.

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CLINICAL AND OPERATIVE GYNÆCOLOGY.

CHAPTER I.

INFLAMMATION OF THE UTERINE APPENDAGES.

General Considerations.

The important position taken in gynæcology by inflammation of the uterine appendages, the ovaries and tubes, has but recently been generally admitted. Aran and his pupil Siredey[1] clearly recognized the fact; but in spite of the appreciation of its importance by these physicians, it was for a long time condemned to oblivion because not indorsed by the surgeons. The fame of Lawson Tait's[2] operations has done more to popularize this truth than all the reasonings of physiology and pathological anatomy; it has thrown a great light upon the controversy waged over perimetritic inflammations.

The interminable and wearisome discussion over the question as to whether inflammation began in the cellular tissue about the uterus or in the neighboring peritoneum—of a perimetritic phlegmon or a pelvic peritonitis—a discussion which fatigued a whole generation, is now only a memory. The ardent controversy upon this subject between Nonat, Bernutz, Goupil, and Gallard seems as superannuated as the discussions between Gendrin and Lisfranc concerning uterine engorgement and chronic partial endometritis in explanation of the same symptoms. Even the distinction between para- and perimetritis still made by modern authorities seems unnecessary in clinical practice. It is a vestige of old theories. To understand the close connection of the uterus and the tubes, we must bear in mind the fact of their common embryonic origin. At the end of the second month of intrauterine existence, the ducts of Müller become fused together at the lower portion to form the uterus and vagina, while above they remain separate and form the tubes, which are in reality a slender prolongation of the horns of the uterus; the various coats of both are directly

continuous with each other—a fact which explains the possibility of ascending salpingitis following endometritis, just as an ascending pyelitis may follow chronic cystitis. The ovary, which is connected with the tube by the tubo-ovarian ligament and is almost directly in contact with the ampulla, may also be easily infected by continuity.

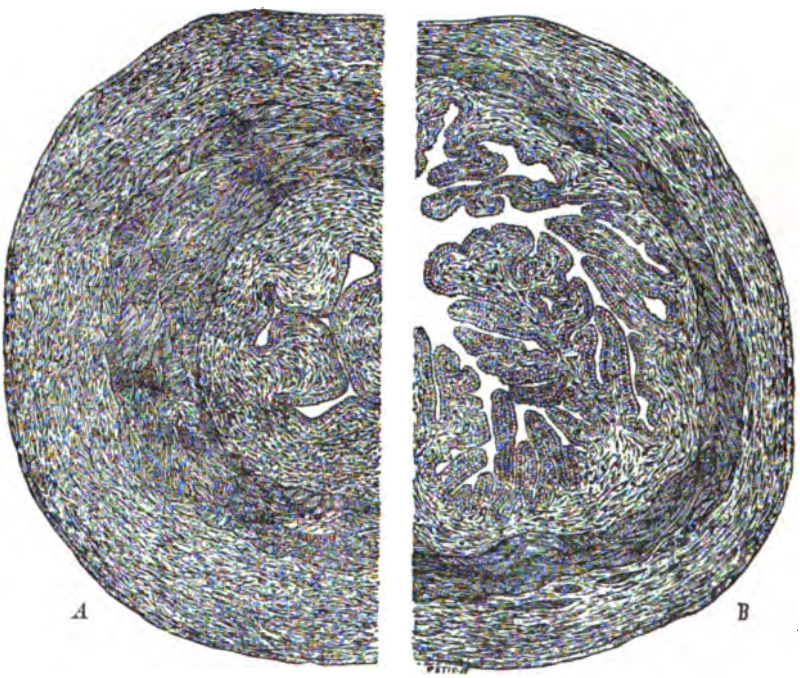

FIG. 1.—FALLOPIAN TUBES, NORMAL CONDITION. *A*, Transverse section of tube near the uterus. *B*. Section from the ampulla (Wyder). Layers of the Fallopian tube: 1, Upper and outermost layer, serous coat; 2, layer of loose connective tissue, richly supplied with blood-vessels; 3, muscular coat, much thicker near the uterus (uterine segment) than near the ampulla (abdominal segment). It is principally made up of circular fibres. Above and within it is reinforced by longitudinal fibres, some of which spread into the mucous layer, others (the most external) penetrate between the layers of the broad ligament; still others go to the hilum of the ovary or are prolonged to the fundus of the uterus; a few fibres penetrate to the inner layer; 4, mucous coat. The framework of this layer is embryonic connective tissue, rich in fusiform cells; it projects into the lumen of the tube in longitudinal folds which have been cut through obliquely in the section shown above. Near the uterus these folds are radiating and give a star-shaped appearance to the lumen in the section. Near the ampulla they are longer and reduplicated, which gives the lumen a jagged and toothed appearance on section. The whole surface of the mucous membrane is lined with simple columnar ciliated epithelium; the movement of the cilia is in the direction of the uterus.

Moreover, these organs are bound together by important vascular and lymphatic vessels. I will remind you of the anastomoses of the utero-ovarian arteries and veins with the uterine vessels. More important still are the lymphatic connections. To Lucas Championnière, after Cruiksanck and Cruveilhier, belongs the credit of having called attention to it.[3]

He described with especial care the superficial lymphatics, at the angles of the uterus, which are lost in the broad ligaments behind and below the tubes, between the tube and the round ligament, and especially below the ovary and tube. There are also deep lymphatics which can be demonstrated only by making a longitudinal section of the uterine angle; here a group of lymphatics is situated in the hollow between the tube and the ovarian ligament. Thus important

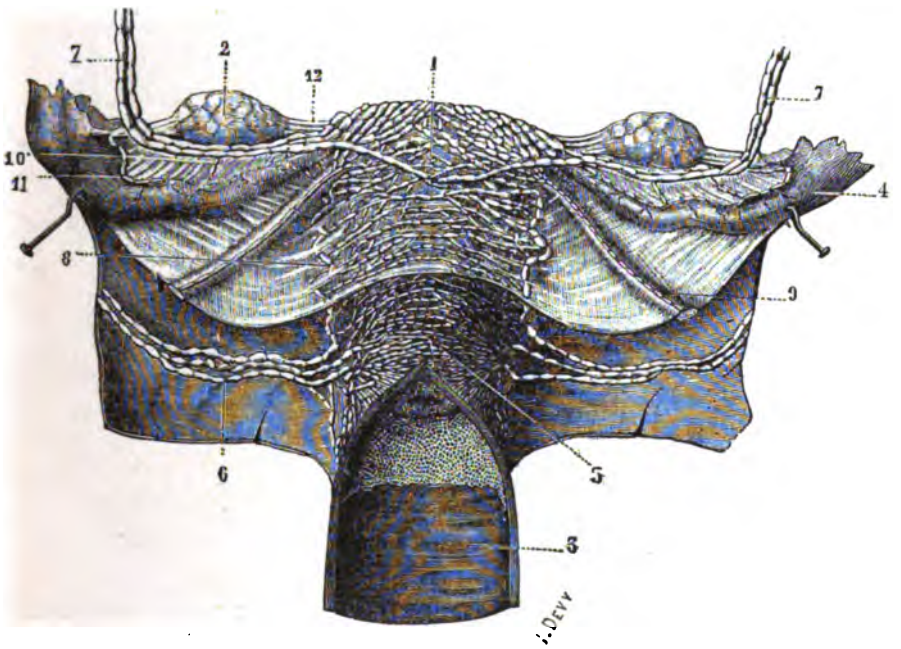

FIG. 2.—LYMPHATICS OF THE UTERUS (POIRIER).—1, Lymphatics from the body and fundus of the uterus; 2, ovary; 3, vagina; 4, Fallopian tube; 5, lymphatics from the cervix; 6, lymphatic vessels from the cervix going to the iliac ganglia; 7, lymphatic vessels from the body and fundus going to the lumbar ganglia; 8, anastomosis of cervical and uterine vessels; 9, small lymphatic vessel in the round ligament going to the inguinal glands; 10, 11, lymphatic vessels of the tubes which empty into the large lymphatics vessels from the body of the uterus; 12, ovarian ligament.

lymphatic communications are established between the ovaries and tubes, which have such a close anatomical connection. There is scarcely ever an ovaritis uncomplicated by salpingitis, or a salpingitis unaccompanied by ovaritis.

As a rule, inflammation passes by direct contact and adhesion from the tube to the ovary. Sometimes, however, there is suppuration of the ovary without continuity of the inflammatory condition of the tube; this is explained by the lymphatic supply. The vessels from the ampulla follow the broad ligament to the outer side of the ovary, and join the larger lymphatic network called the subovarian plexus.

It is not hard to understand that an abscess of the ovary may coincide with relatively unimportant lesions of the oviduct.[4] Adhesions, which are rich in lymphatics, as Poirier has shown, may also transmit inflammation.*

Again, the network of lymphatics which covers the surface of the ovary communicates with the lymphatics of the peritoneum. According to Waldeyer,[5] if a lymphatic injection tube is inserted into the ovary, the whole network of lymphatics in the abdominal serous

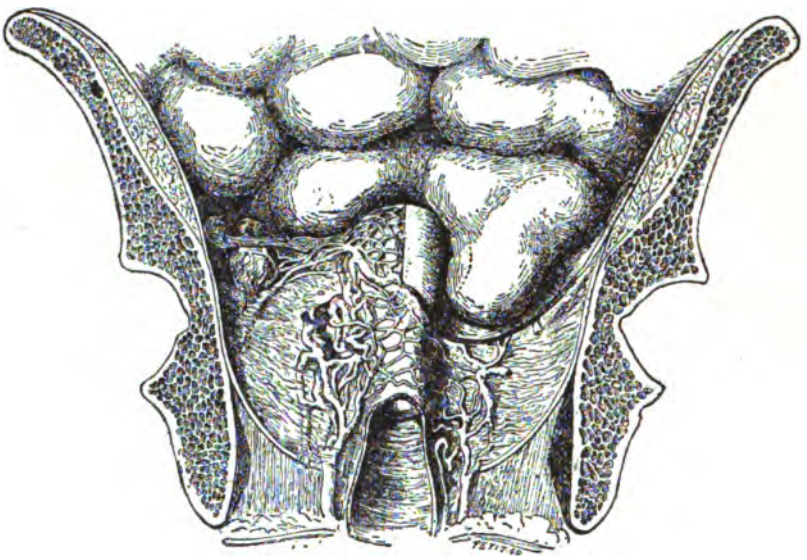

FIG. 3.—VERTICAL SECTION OF THE PELVIS, SHOWING THE SUPERIOR PELVI-RECTAL SPACE AND THE ISCHIO-RECTAL FOSSA. (On the left the section is on a level with the broad ligament; on the right it is a little in front.)

membrane may be filled from it. The fact that peritonitis following inflammation of these organs usually remains circumscribed in extent is probably because the first stage of the process consists in a plastic obliteration, a sort of adhesive lymphatic thrombosis. Finally, the subperitoneal cellular tissue in the fimbriæ of the tube and in the ovary is a sort of appendage to that of the broad ligament, which is continued below on to the pelvic floor, and on the sides is continuous with the laminated tissue more or less infiltrated with fat, which lines the peritoneum, and which is especially loose in front of the bladder

* I shall use the terms *peri-uterine*, *peri-ovaritis*, *peri-salpingitis*, which usage has sanctioned, although they are of defective composition, since they are formed by the union of a Greek and a Latin word. The correct terms would be: circum-uterine, circum-ovarian, tubo-ovaritis, or else peri-metritis, peri-oöphoritis, oöpho-ro-salpingitis.

in the pseudo-cavity of Retzius (Fig. 3). A knowledge of these details is absolutely necessary in explanation of the deep and superficial transmission of inflammation.

Various widely differing classifications of salpingitis have been made.

Cornil and Terrillon[6] give the following:

1. Catarrhal vegetative salpingitis.
2. Purulent salpingitis (pyo-salpinx).
3. Hemorrhagic salpingitis (hæmatoma of the tube; hæmato-salpinx).
4. Blenorrhagic salpingitis.
5. Tubercular salpingitis.

This division is incomplete, for it ignores certain forms of diffuse interstitial inflammation found in chronic disease. It is a little defective in that it separates purulent from tubercular and blennorrhagic salpingitis, which are merely varieties of the first. Orthman[7] makes this division:

1. Catarrhal salpingitis with its varieties: simple, diffuse, interstitial, hemorrhagic, follicular.
2. Purulent salpingitis, which may be septic, blennorrhagic, or tubercular.
3. Hæmato-salpinx.
4. Hydro-salpinx.
5. Pyo-salpinx (or purulent cystic salpingitis). From both a clinical and an anatomical standpoint, I think it of importance to classify the inflammations of the tubes according to whether they terminate or not in the formation of an encysted tumor. We should thus have:

I. Non-cystic salpingitis.
- *a.* Acute catarrhal.
- *b.* Acute purulent.
- *c.* Chronic parenchymatous (pachy-salpingitis).
  - Hypertrophic or vegetative variety.
  - Atrophic or sclerous variety.

II. Cystic salpingitis.
- *a.* Hydro-salpinx, or serous.
- *b.* Hæmato-salpinx, or hæmatic.
- *c.* Pyo-salpinx, or purulent.

I do not bring in the factor of etiology; for a blennorrhagic salpingitis, for example, may develop in one of several widely differing ways into a purulent non-cystic, or purulent cystic salpingitis or pyo-salpinx, which may be converted into hydro-salpinx or form a parenchymatous salpingitis.

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3. J. L. Championnière: Lymphatiques Uterins, etc. Thèse de Paris, 1870. As to Cruveilhier, we must look in his Pathological Anatomy and not in his Descriptive Anatomy for a description of the lympathics of the Uterus. The reason for this is that it is much easier to pursue researches upon pathological cases, and upon women who have died of puerperal fever, the lympthatic vessels being rendered much more prominent by pregnancy and inflammation. See account of Porier's interesting researches: Du Rôle des Lymph. dans les Inflam. de l'Utérus. Progrès Médical, 1888, Nos. 47, 48, 49, 51, and 1890, Nos. 3 and 4.

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CHAPTER II.

OÖPHORO-SALPINGITIS WITHOUT CYSTIC TUMOR.

(*Acute Catarrhal and Purulent Salpingitis, Non-cystic. Chronic Parenchymatous Salpingitis.*)

Pathology—Etiology.—Is there such a thing as primary ovaritis, an idiopathic lesion connected with menstrual disorders and venereal excesses, and quite independent of all infection or preceding lesion of the uterus and tubes? Dalché and Prochownick[1] have recently upheld this view, but scarcely with convincing proofs. It seems to me very doubtful. I do not think that there are any cases of ovaritis, properly so called, that are not preceded by endometritis and salpingitis. It is true that one or the other of these conditions may have existed without leaving any permanent anatomical traces, but a study of previous symptoms will prove that they did exist.

I shall therefore use the terms tubo-ovaritis or oöphoro-salpingitis, and if for the sake of brevity I say salpingitis or ovaritis it will be understood that the word signifies a mixed lesion. Inflammatory conditions of the uterus are, without doubt, the chief cause of inflammations of the appendages. Postello[2] long ago compared the extremity of the tube to the epididymis, and Bernutz[3] clearly defined the analogy between tubo-ovaritis of blennorrhœal origin in the female and epididymo-orchitis in the male. In specific and other inflammations, the infection is carried from one place to another by means of the continuity of the mucous tissues. Schröder considers this the only method of infection, and in a recent discussion at the Surgical Society the majority of speakers held the same opinion.[4] J. L. Championnière[5] was almost the only one to advance the view that the lymphatics carried infection, although he himself formerly considered this the case only in the puerperal condition. He lays especial stress upon the relative integrity of the uterine extremity of the tubes, even when two-thirds of the external portion are much affected. We may say in reply that the integrity is only apparent; the microscope reveals an inflamed condition of the tube when the naked eye is unable to perceive any trace of it. Moreover, analogous interruptions in the con-

tinuity of inflammations occur in the series of lesions carried from the bladder to the ureters and kidneys. Yet the part played by the lymphatics must not be ignored. Adhesions very often bind the fundus of the uterus to the appendages. As Poirier has shown, these adhesions are almost entirely composed of lymphatics which connect the sub-endothelial uterine plexus with the lymphatics of the appendages. These adhesions are without doubt the result of the action of a previously existing endometritis upon the deep lymphatic plexus of which the sub-endothelial plexus is merely a continuation. Inflammation from the body of the uterus may be carried along this channel to the tubes and ovaries, especially if some new pathological influence comes to accelerate the process.

However this may be, if a catarrhal endometritis last any time, the tubes are always affected, but the symptoms caused are so slight that this epiphenomenon does not attract the attention of the clinician. In aggravated cases of endometritis with slight salpingitis, only the former condition is recognized and treated. On the other hand, in marked salpingitis, a slight endometritis, though it may be the cause of the tubal affection, may easily be overlooked.

The frequency of endometritis quite explains that of salpingitis, the more so that a temporary endometritis is usually followed by a permanent lesion in the tubes. Winckel[6] found, upon 575 female cadavers, 182 more or less pronounced lesions of the appendages. Arthur Lewers,[7] in 100 autopsies at the London Hospital, found 17 times lesions of hydro-, pyo-, or hemato-salpinx. Galabin, from the year 1883 to 1886, in Guy's Hospital, found 12 cases out of 302 autopsies, or 4%. As Lawson Tait remarked, patients in this hospital come from a class more well to do than those of the London Hospital, and gonorrhœal and puerperal infection are consequently less frequent.

Gonorrhœal infection is the most usual cause of inflammation of the tubes, if one is to believe Noeggerath, who took up the study of this subject after Ricord, Requin, and Bernutz.[8] He lays especial stress upon inoculation with the gonorrhœal virus which is, so to speak, attenuated in strength, a vestige of an old gonorrhœa, which is often neglected because considered at the same time incurable and harmless (gleet). Many newly married women may be infected in this way, and the fatigues of the wedding journey thus accounted for. Slight endometritis and intense catarrhal salpingitis are often caused; abortion follows and aggravates the condition of the patient, who may long remain an invalid and sterile.

Gonorrhœal infection often leads to graver diseases, causing a sudden suppuration of the tubes, which becomes encysted or extends to the pelvis.[9] This is the form described by Bernutz, and that I have also frequently seen at Lourcine. In one case I witnessed an overwhelming onset of gonorrhœal pyæmia, with multiple foci of suppuration scattered about in the subperitoneal cellular tissue and in the substance of the mesentery. There was intense vaginitis and pyo-salpinx. Neisser's gonococcus cannot always be identified, even when the gonorrhœal origin of the affection is undisputed. It has, however, often been found.[10]

Puerperal infection following labor, and especially abortion under septic conditions, should be placed among the chief causes of inflammation of the appendages. In women who are suffering from gonorrhœa at the time of parturition, a *mixed infection*[11] is produced, puerpero-gonorrhœal, which explains the frequency of metro-salpingitis in these cases. Lesions of the tube are especially to be feared in post-abortum endometritis with retention of placental débris, which is a strong argument in favor of energetic interference (cleansing with a blunt curette, and irrigation) instead of the expectant treatment or timid interference recommended by some authorities. The cures obtained by these last methods are only apparent. Any patient in whose uterine cavity gangrenous placental débris remains for several days, is sure to develop a metro-salpingitis.

Contamination from Obstetrico-surgical Exploration and Interference.—I refer the reader to what has already been said upon this subject in the chapter on Endometritis.

The uterine sound has had many victims, and also discission of the cervix, before the days of antisepsis. Even at the present day, we must bear in mind that, in order to secure intra-uterine exploration from danger, not only must the instrument and the finger be free from germs, but the cervical canal must, by repeated washings, have been freed from the organisms which it normally contains.[12] The presence of a constant source of infection in the cervical canal (Winter) may account for the existence of some cases of endometritis and salpingitis which have no other apparent cause than a difficulty experienced in the evacuation of the cervical secretions, from some displacement or stenosis; the normal drainage of this mucus filled with microbes that are virtually pathogenic being interfered with, there is a reflux into the uterine cavity, after marked dilatation of the cervical canal itself. Might not an auto-infection be thus produced? It is

very certain that inflammation of the uterus and adnexa is rarely absent in this condition.[13]

Tubercular salpingitis may coexist with other affections of the genital apparatus of the same nature, and be lost, so to speak, among the graver lesions. But tubercular salpingitis has often been observed as an isolated lesion.[14] Are these cases of tubercular salpingitis, which are of more frequent occurrence than is generally supposed, to be attributed to auto-infection or to hetero-infection (by the introduction of tubercular semen into the genital tract)? The point of entrance of Koch's bacillus seems in many cases to have been the genital tract (Cohnheim, Verneuil).[15] But there are frequent instances of tuberculosis of the appendages in virgins which are quite unaccounted for by this explanation; it is very likely that they are in the first place due to an ordinary auto-infection caused by cervical stenosis, and that the bacilli introduced into the circulation through the pulmonary or digestive tract fix upon the inflamed tubes as the point of least resistance. This hypothesis harmonizes with the prevalent ideas of general pathology upon what is called pre-tubercular inflammations. Malformations or congenital atrophy of the tubes would also cause a morbid predisposition of these organs, as Lawson Tait[16] has pointed out, and upon which Freund[17] has dwelt with, perhaps, too much emphasis.

I will merely mention as of passing interest the rare causative influence of eruptive fevers,[18] especially scarlatina or variola, which Lawson Tait has demonstrated, and the very problematic influence of genital papillomata[19] mentioned by Alban Doran to explain a papillomatous salpingitis whose exact nature was undetermined.

The cases of syphilitic salpingitis which have been reported will not bear investigation.[20] Further observations upon this subject are needed. The salpingitis due to actinomycosis[21] is a mere anatomical curiosity.

Pathological Anatomy.—I. *Lesions of the Tubes.*—These are in the acute variety at least more constant and more characteristic than those of the ovaries, the mucous lining being more vulnerable than the serous membrane surrounding the uterus.

The comprehensive term catarrhal salpingitis has been much abused. A glance at the records published on the subject will show that it has been applied to the most varied pathological conditions. Every non-purulent inflammation of the tubes, from a simple and slight salpingitis accompanying an endometritis and simultaneously

cured with it, to a hypertrophic pachy-salpingitis with abundant vegetations on the folds of the mucous membrane, and excessive thickening of the walls has been placed pellmell in this class. This confused classification makes it extremely difficult to properly estimate the therapeutic value of the various operations recently performed in France and other countries. The knowledge that a slight increase in size and a trifling congestion of the Fallopian tubes constitute a salpingitis in the eyes of some surgeons, and call for removal by operation, causes one to hesitate before indorsing the value of the brilliant series of operations, which really demonstrate only the incontestable simplicity and innocuousness of ovariotomy performed with aseptic precautions. To form an exact opinion it would be necessary to have each report of extirpation of the appendages accompanied by a condensed but accurate description of the lesion, instead of being labelled as vaguely as it is at present. I believe, moreover, that acute catarrhal salpingitis should be carefully distinguished from chronic parenchymatous salpingitis with acute exacerbations; they have often been confounded under the common name of catarrhal vegetative salpingitis, because a sufficiently detailed clinical history has not been secured in regard to the patients from whom the histological specimens were obtained. This confusion is made easier by the fact that many women are operated upon for a lesion of long standing after an acute exacerbation which puts one on the wrong track as to its exact duration. Finally, acute purulent, non-cystic salpingitis must not be confounded with purulent cystic salpingitis or pyosalpinx, in which indeed it may terminate if of long duration, but which is as distinct from it as pyelo-nephritis is from pyo-nephritis.

In acute catarrhal salpingitis we find in the first place a hypertrophy of the organ, which is swollen cylindrically from about the size of the little finger to that of the thumb, this being due as much to an infiltration of the walls as to that of the subserous tissue. As the lower border of the tube is bound to the broad ligament, it is obliged to twist and bend until it presents a lumpy and moniliform appearance. The fimbriated extremity is sometimes patulous and turgescent, more often folded up like an unopened daisy. False membranes which are usually fine, soft, lamellated or filamentous, and transparent enough to show the blood-vessels in their substance, often bind the tubes to the ovaries and adjacent structures.

The external surface of the tube is of a pinkish tint, somewhat deeper in color near the outer extremity. On section, the cavity is

seen to be filled with the normal but hypertrophied folds of mucous membrane, which are pinkish or silvery gray in color, giving the appearance of vegetations; mucus sometimes is seen on the surface.

A histological examination[22] shows that the lesions are especially marked in the mucous membrane; the folds are covered with lateral, newly-formed vegetations; instead of being thin, they are thick and club-shaped. Many of them anastomose at the internal extremity, which gives a reticulated appearance to the section. The framework

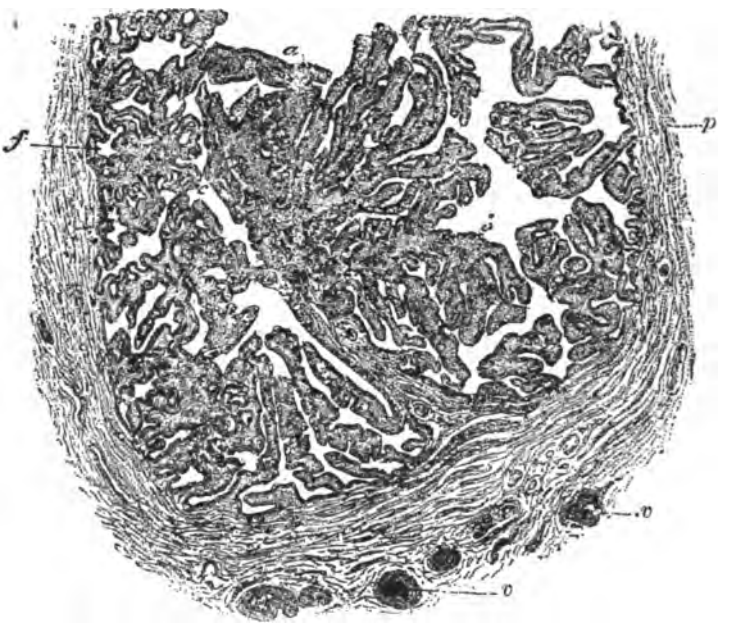

FIG. 4.—ACUTE CATARRHAL SALPINGITIS. (Transverse section of median portion of tube; enlarged ten diameters.) *a*, *b*, Foliaceous vegetations springing from a thickened fibro-vascular partition which rises from the wall and projects to the centre of the lumen. The villi and parietal folds by frequent anastomoses form the walls of pseudo-glandular cavities (*f*); *p*, fibro-muscular walls of the tube; *v*, *v*, blood-vessels (Cornil).

of these vegetations is cellulo-vascular, infiltrated with embryonic cells; they are lined in some places by a layer of columnar, ciliated epithelial cells. The fibro-muscular coat is, as a rule, but slightly affected, there being only a hyperplasia of its substance.

Acute purulent, non-cystic salpingitis is more rarely met with than the encysted form, pyo-salpinx, in which, however, it invariably terminates if it lasts long and if the pus cannot be evacuated through the uterine cavity. According to Freund,[23] this unfavorable result is largely dependent upon incomplete development of the oviduct. He

claims that two forms of Fallopian tube exist normally—one almost straight and of normal calibre; the other much twisted and with diminished calibre in some spots, this being the remains of an infantile condition. In the first class of cases, tubular affections develop rapidly and tend to a spontaneous cure. In the second, from the atresia of the oviduct, suppurative inflammations necessarily result in encysted collections of pus. This condition of things is to be looked for in persons of delicate constitution in whom dysmenorrhœa accompanies the onset of menstruation. This view of the case may be correct, but, as a rule, it is only necessary that the inflammation be very intense in its nature, to produce, in addition to the protective occlusion of the ostium abdominale, a swelling and infiltration of the walls so marked that the lumen is obliterated, or ceases to be permeable at the uterine orifice. This is what often occurs in gonorrhœal affections. However that may be, the transformation into a pyosalpinx is always preceded by an acute purulent, profluent salpingitis, if the term be permitted, which means that the ostium uterinum is permeable and permits of a free evacuation of the purulent secretion. If an operation be performed at this stage, we shall observe all the external signs of intense inflammation of the tubes: swelling, a twisted, knotty, lumpy condition of the oviduct, with the fimbriæ so agglutinated as to close the abdominal orifice. On section the tube is found to be filled with pus, the cavity often resembling a string of beads, owing to the contractions.

The pus, which is creamy like all pus of recent formation, can easily be evacuated through the uterine cavity, as the ostium uterinum is not occluded like the ostium abdominale. The mucous membrane is downy and of a grayish tint. Under the microscope a transverse section, shows very thick reduplications covered with anastomosing vegetations, forming a system of primary and secondary folds, enclosing irregular cavities that look like glands. This thickening is due to the infiltration of migratory cells in the connective tissue.

The ciliated cells are destroyed, and the epithelial cells are changed in shape, becoming cubical or flat, and preserving their normal shape only in the sinuses, whose pouch-like endings are lined with a basement membrane of columnar cells which still further increases their resemblance to glands (Fig. 5). The whole thickness of the wall is also infiltrated with these round migratory cells, and the blood-vessels are dilated (Cornil).

If purulent salpingitis does not go on to the formation of pyo-

salpinx it may, as clinical experience has demonstrated, be spontaneously cured.

This retrogressive process is rare, however, and during its progress the patient is at any moment liable to a return of the acute phenomena. When it does occur, the cure takes place by induration, as it used to be called; that is, by the formation of embryonic connective tissue which, temporarily at least, results in a hypertrophy of the

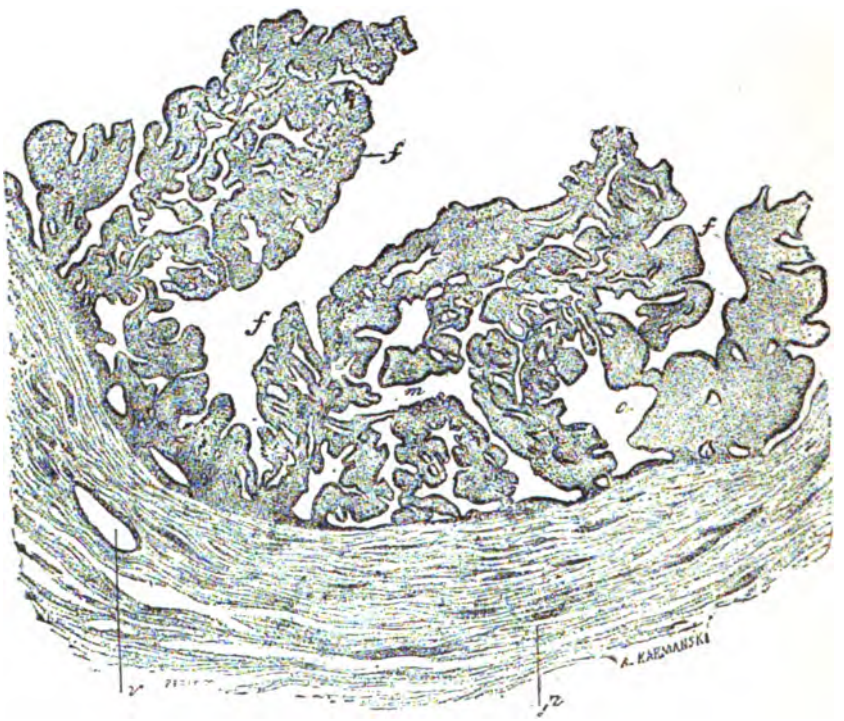

FIG. 5.—ACUTE PURULENT SALPINGITIS. Transverse section (magnified 12 diameters). *f*, *f*, Thickened vegetations, for the most part joined to each other in such a way as to form narrow openings of glandular appearance; *p*, wall of tube; *v*, blood-vessel (Cornil).

organ, a pachy-salpingitis (Cornil). Fig. 6 gives an excellent representation of purulent salpingitis, which seems to be in process of development. The vegetations which were at first isolated are now united and form an embryonic tissue which at first sight seems to be homogeneous. This new layer of tissue lines the walls of the tube and diminishes its calibre by projecting into the lumen in the form of papillomata formed of embryonic tissue. If the pus disappears and these perishable vegetations become organized, a chronic salpingitis will be established. In chronic parenchymatous salpingitis it is usual

to find both tubes involved, whereas acute and unimportant leisons may be unilateral. This circumstance has given rise to Lawson Tait's [24] rule of always removing the annexa of both sides, as, if left, the sound side usually succumbs later. The ovary is usually implicated as well, being affected with sclerosis or peri-ovaritis. Strong adhesions, as a rule, bind the appendages to the pelvic walls or to Douglas' cul-de-sac. These adhesions may even become so tough that the ovary and

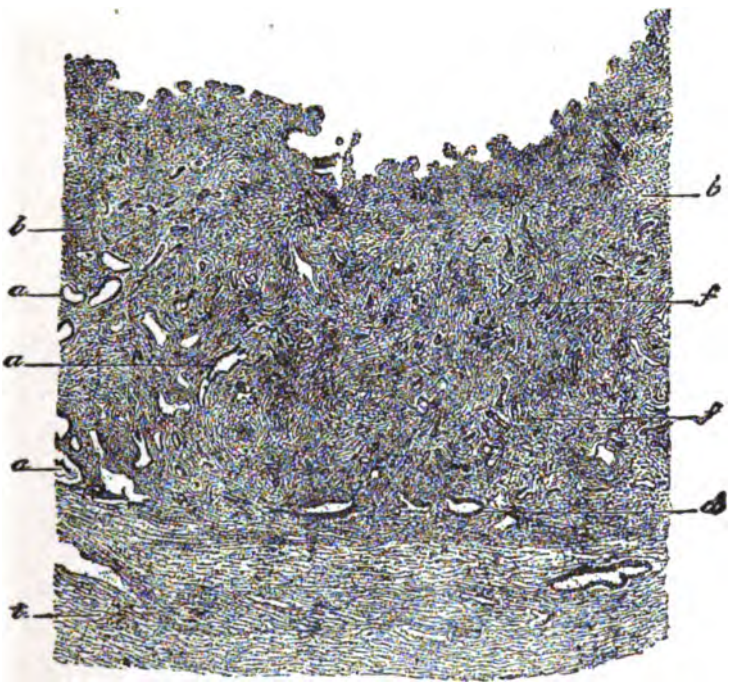

FIG. 6.—ACUTE PURULENT SALPINGITIS. Transverse section (magnified 12 diameters). *t*, Connective tissue of the walls. Above the connective tissue is a thick layer of embryonic tissue *b*, *b*, filled with cavities *a*, *a*, *a*, covered with epithelal cells and narrower crevices *f*, *f*, which also contain epithelial cells; *d*, similar cavities nearer to the walls (Cornil).

tubes, which have become quite friable, cannot be detached without being torn to pieces. The thickened tube is often hard and cordlike.

The lesions, instead of being limited to the mucous membrane as in the preceding forms of salpingitis, include the whole thickness of the walls. The middle layer, the parenchyma, is even more altered than the other coats; so that chronic salpingitis, even more than chronic endometritis, may be called parenchymatous. On section we recognize the great thickness of all the walls. The mucous membrane is slate-colored. The external orifice is always oblitered and some-

times adheres rather loosely to the ovary. The uterine orifice, on the contrary, is usually permeable. The lesion has also been called pachy-salpingitis, or interstitial salpingitis because of the increase in connective tissue as shown by the microscope. It is analogous to chronic epididymitis with sclerotic degeneration of the spermatic cord. Two anatomical varieties of this affection may be recognized, which correspond with those of parenchymatous endometritis. In the first, which was ably described by Kaltenbach, and then by Schauta and Sawinoff,[25] and of which I have seen examples, there is a chronic hypertrophic salpingitis. The tube, about as large as the little finger or the index, is the color of wine-dregs, purple, and of fleshy consistency. Upon cutting it, we find a thick shell of hypertrophied muscular tissue, or of newly formed connective tissue; and beneath, filling

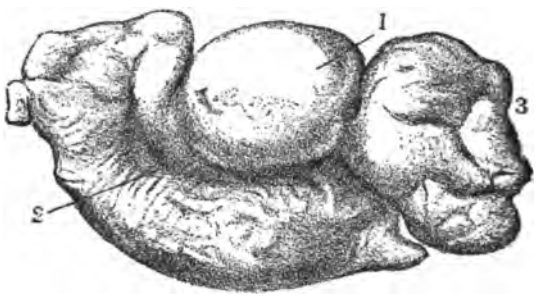

FIG. 7.—HYPERTROPHIC PACHY-SALPINGITIS AND SCLEROSED OVARY. 1, Small parovarian cyst of the broad ligament; 2, thickened tube; 3, sclerotic ovary fused with the fimbriated end of the tube. (Specimen removed by laparatomy.)

the interior of the obliterated lumen, as the marrow fills bone, is a pulpy substance of brilliant silvery appearance, formed by the mucous membrane whose epithelium is greatly altered. In Kaltenbach's case the vessels were much dilated, and there were a number of hemorrhagic spots on the walls. The abdominal end of the tube was obliterated, the uterine extremity merely narrowed. These cases seem to me to point to the previous existence of a purulent salpingitis, which was saved from cystic dilatation by the permeability of the ostium uterinum. In the cases observed by me, and by Kaltenbach and Schauta, there was every proof of previously existing gonorrhœa.

These authorities attribute too much importance to the muscular hypertrophy in the production of the colicky pains of salpingitis; the same pains are noticed when the hypertrophy is confined to the connective tissue, and seem to be due to compression of the nerve filaments, to a perineuritis which Sawinoff has conclusively demon-

strated. There is another variety of chronic salpingitis which may be called atrophic. The cellular infiltration of the walls of the tube, instead of giving rise to a permanent product, is reabsorbed, and by a

FIG. 8.—CHRONIC HYPERTROPHIC SALPINGITIS. Transverse section of the tube shown in Fig. 7. (Magnified 10 diameters.) 1, Thickened and sclerosed wall of the tube; 2, thickened and united villi; 3, pseudo-glandular structures; 4, blood-vessel; 5, accessory duct of the tube.

formation of cicatricial tissue causes contraction. This is probably a more advanced state of the hypertrophic pachy-salpingitis which has gone on to cirrhosis of the Fallopian tubes. The muscular tissue disappears before the fibrous tissue, the whole organ contracts, and, in extreme cases, is changed to a hard and impermeable cord. Boldt[26] has carefully studied and described these lesions. He has often seen the lumen of the tube completely obliterated by agglutination of the

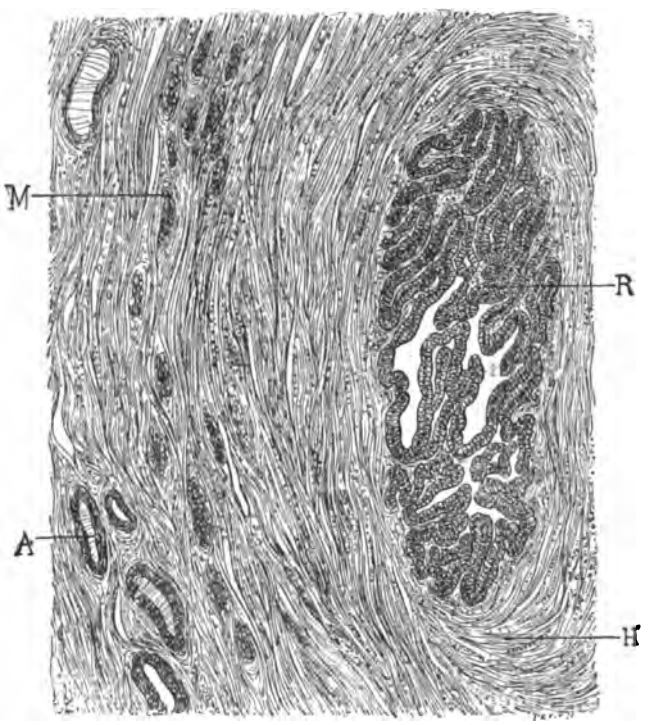

FIG. 9.—ATROPHIC FORM OF CHRONIC SALPINGITIS (BOLDT). Slight enlargement. Remains of mucous folds and obliterated lumen. *H*, Hypertrophy of submucous connective tissue and of the middle coat; *M*, scattered muscular fibres cut transversely; *A*, arterioles near the peritoneal surface.

walls. He compares the destruction of the epithelium which occurs under those circumstances to cirrhosis of the liver and kidneys. Orthmann describes, under the name of follicular salpingitis, an anatomical lesion which scarcely merits a special classification. It is distinguished by cystic cavities in the walls, giving it an areolar appearance, but this pseudo-glandular character is common to all the varieties of tubal inflammation (Figs. 5 and 6.)

In all the varieties that I have described, the tube may continue to

form a canal open at both ends, and the permeability of the ostium uterinum allows of an evacuation of the mucus as soon as it is formed. This of course prevents ampullar or cystic dilatation.

II. *Lesions of the Ovary.*—The ovary, which often preserves its integrity in catarrhal salpingitis, is usually affected in acute purulent and in chronic salpingitis. It is generally displaced, fixed by adhesions in Douglas' cul-de-sac or to the sides of the pelvis. It may suppurate independently of the tube, but quite exceptionally. As a rule, ovarian lesions follow, rather than precede, those of the tubes; when they do exist alone, it is under the form of chronic sclero-cystic ovaritis.

Little is known in regard to the initial lesions of acute ovaritis;[27] the advanced lesions most often met with are: 1st, adventitious membranes (adhesion tissue, which I shall not describe); 2d, micro-cystic degeneration; 3d, sclerosis; 4th, suppuration.

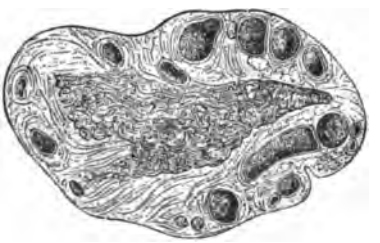

FIG. 10.—SCLERO-CYSTIC DEGENERATION OF THE OVARY.

Micro-cystic Degeneration.—This name, or that of chronic follicular oöphoritis, has been given to a lesion characterized by the presence of a great number of small cavities, varying in size from that of a millet-seed to a pea, which are scattered over the surface of the ovary, and which have often been found when castration was performed merely to relieve pain (Battey's operation). These cavities contain a clear, serous fluid and occasionally clots.

Some authorities consider that this constitutes a pathological condition,[28] but the majority believe there is nothing morbid about it.[29] It is certainly reasonable to suppose that these small follicular dropsies are in themselves non-inflammatory, and they are often met with when no symptoms pointed to their existence. Nevertheless they may by their number impair the integrity of the organ; interstitial sclerosis, as a matter of fact, is often met with in ovaries thus affected. In some cases it would seem as though we had to do not with follicular dropsy, but with hydrops of the ovules. When this is

the case, according to Toupet we can clearly distinguish the following layers from the periphery to the centre of the cyst; first the layer of cubical cells of the wall, then a narrow granular zone formed probably of the detritus of cells, a second epithelial peri-ovular layer, a more or less distinct hyaline membrane corresponding to the vitelline membrane, a granular mass representing the vitellus which has become dropsical, and showing in its centre a nucleus with nucleolus.[30]

Sclerosis of the ovary, or interstitial ovaritis, is the lesion most usually found in subacute or chronic inflammations. In the early stages it is compatible with ovulation, but, if it be at all advanced, the follicles are compressed and choked (Slavjansky). The compression of the nerve filaments,[31] which is due to the same cause, has been considered the chief reason of the nervous symptoms for which Battey's operation is performed.[32] In the majority of cases the immediate cause of the cirrhosis seems to be a localized peritonitis, a perioöphoritis which progresses from the periphery to the centre. This peri-oöphoritis may, however, be absent (Nagel) and the starting-point of the process be in the interstitial tissue of the ovary itself. In these cases the hypertrophied ovary may attain the size of a hen's egg, and show the mammillated, mulberry-like surface of a cirrhotic ovary (Fig. 7). Jones[33] found a most interesting lesion in such an ovary, which was of the size of an egg, granular on the surface, which was prolapsed and had been removed by operation. The lesion (to which I have already referred under the head of chronic endometritis) consisted in a dilatation of the lymphatics. The lacunæ were filled with a nearly homogeneous lymph containing a few lymph-corpuscles; an elastic coát and a thick endothelial lining could be clearly seen.

Cirrhosis of the ovary usually accompanies micro-cystic degeneration, thus forming a mixed lesion, sclero-cystic ovaritis, which is more frequent in occurrence than either lesion alone.

Suppuration of the ovary, as a rule, coexists with that of the Fallopian tube; the two are, so to speak, amalgamated, and form the wall of the same purulent pouch, so that pyo-salpinx is in reality a pyo-oöphoro-salpingitis.

It sometimes happens that, while the tube shows signs of a chronic interstitial inflammation, the ovary alone becomes transformed into a purulent cavity or contains a number of circumscribed abscesses.[34] In such cases the inflammation is usually propagated by means of adhesions or by inoculation from the tubes which are the first to be affected and which, after evacuating their contents into the uterus, go

on to the establishment of a chronic inflammation, while the suppurative process continues in the ovary. Or, again, when these organs remain far apart, the ovary may be indirectly affected through the lymphatics. However this may be, it is very probable that the formation of an abscess in the ovary is usually favored by the pre-existence of a small cyst, either of a follicle or of the corpus luteum or perhaps simply by micro-cystic degeneration. If this predisposition do not exist, then an acute inflammation will be more likely to give rise to peri-oöphoritis.

Symptoms.—It is rare to find an acute salpingitis without coincident inflammation of the uterus, so that it is difficult to decide with precision to which lesion the symptoms are due. The uterine symptoms (uterine syndroma) which I have fully described are usually most marked, yet there are a few special signs by which we may know that the tubes and ovaries have become inflamed.

Pain is characterized by pseudo-neuralgic crises situated in the neighborhood of the appendages or in the lumbar region; it radiates upward to the epigastrium and downward to the thighs. Sometimes, but not always, the pain is of a colicky nature, called salpingeal, and its cessation is characterized by the evacuation of muco-pus, which comes not so much from the tubes as from the cavity of the uterus which has been reflexly stimulated to contract.

Pressure, whether it be abdominal or vaginal, near the appendages causes pain. If the inflamed ovary be pressed between the two hands, the pain is exquisite,[35] especially on the left side, for the left ovary is the one most often affected, just as in the male the left testicle is the one most liable to disease (varicocele, epididymitis, etc.). This may be due to the greater frequency of laceration of the cervix on the left side with direct propagation of inflammation either by an ascending endometritis or through the lymphatics.

The pain in the sides and in the lumbar region is often accompanied by gastralgia and vomiting; it is most marked at the menstrual period. Quite exceptionally we may see a case where there is relief from pain during the menstrual period, and crises in the intervals (inter-menstrual dysmenorrhœa). Menorrhagia is an almost constant symptom, but there may also be long periods of amenorrhœa; thus we may have great irregularity in menstruation.

An examination of the inflamed organs is difficult in acute tubo-ovaritis, because of the pain which it causes. If there be any doubt as to the diagnosis, and a decision be imperative, the patient should

be anæsthetized. I hardly know how to protest with sufficient energy against the systematic neglect of this valuable auxiliary to investigation, and against the substitution for it of an inquiry into the anatomical condition of the parts by one means of diagnosis only, namely, localized pain.[36] This neglect is an excellent method of multiplying exploratory laparatomies.

Palpation of the appendages may be done according to the excellent rules laid down by Schultze.[37] To examine the right side, the index and middle finger of the right hand are introduced into the vagina, and the left hand is placed on the abdomen; for an examination of the left ovary, exactly the reverse is done. The patient is upon her back, the knees elevated and the thighs rotated outward, to put the psoas muscles on the stretch. The inner border of these muscles is to be followed as far as the superior strait, after which the exploring fingers are directed more inward toward the horns of the uterus. A small ovoid body, about the size of an almond, is met with and grasped bimanually. An exploration thus conducted can scarcely fail, under anæsthesia, to reveal any existing lesion of the appendages. Nöggerath[38] has suggested that examination of the tubes be made by vesico-rectal touch, and he has by this means appreciated conditions which could not otherwise have been recognized; but as this method is open to some objections, it should be used only as a last resource. Although Hegar claims to have appreciated by touch alone micro-cystic degeneration of the ovary and catarrhal salpingitis, it is very certain that such tactile sensibility will never be possessed by any large number of clinical physicians. Nevertheless, in acute salpingitis, some lesions may be more easily recognized than would seem possible from their limited nature, because of the existence of peripheric œdema which doubles or triples the volume of the inflamed tubes. In chronic salpingitis the tube feels like a resistant cord which is immobilized by adhesions to the sides of the pelvis. When, in addition to these physical signs and to the proofs of a pre-existing endometritis, we find constant localized pain in the neighborhood of the appendages, of the character already described, and from time to time accompanied by acute attacks of peri-salpingitis which I shall describe later on, we may with certainty affirm the presence of salpingitis. We may suspect a purulent condition if the rational symptoms are extremely marked, and if there has been recent gonorrhœa, or gonorrhœa called into activity by septic post-abortum infection.

Differential Diagnosis.—The pain of salpingitis must not be

mistaken for that of ovarian neuralgia, ovaralgia, or painful ovary due to hysteria. This is situated on the left side, as a rule, but may be bilateral. Charcot has shown that it is often accompanied by anæsthesia of the same side and by hystero-epileptiform attacks. This pain is manifested during serious and slight hysterical attacks; pressure brings it back; and as it is frequently associated with dysmenorrhœa of nervous origin, one may be tempted to attribute this symptom to inflammation of the ovary. According to Charcot, the pain really is situated in the ovary. In a pregnant woman who was a hystero-epileptic and suffered from hyperæsthetic ovary, he was able to follow the ascension of the painful zone as the ovary was drawn higher and higher in the abdomen by the enlarged uterus. The characters of the pain are such that it cannot be mistaken for anything else. Graduated pressure causes the appearance of a more or less marked hysterical attack, beginning with constriction in the epigastrium, nausea, cardiac palpitation, accelerated pulse, and globus hystericus; then follow ringing in the ears, sharp pain in the temples and obscuration of sight, all more marked upon the same side as the affected ovary; finally there may be partial or complete loss of consciousness. On the other hand, firm pressure upon the ovarian region may abort or delay the attack; but it must be firm enough to overcome the contractions of the abdominal muscles, which may require the exertion of all one's strength for several minutes. With such a group of symptoms as we have here described, it would be difficult to mistake the purely neuralgic nature of the attack; the presence of other neuralgic pains, paralyses, contractures, and hystero-epileptic seizures will re-enforce the diagnosis. Moreover, hysterical stigmata may be found—hysterogenic zones (submammillary, dorsal), anæsthetic regions, narrowing of the field of vision, etc. The way in which the patient tries to avoid the pain caused by pressure is in itself characteristic of hysteria; when the appendages are really inflamed, the patient groans and instinctively tries to push away the hands of the examining physician; in the case of hyperæsthetic ovary, the movements lack co-ordination, and are of an irregularly convulsive type.

Lumbo-abdominal neuralgia, which may exist alone, and which so often accompanies endometritis, is recognized by its location in the abdominal walls, and by the fact that it is awakened by superficial pressure, especially upon the points of emergence of the cutaneous nerve filaments. Pressure over the appendages may give pain, be-

cause at the same time the abdominal walls are pressed upon; we can readily ascertain where the pain is actually situated by trying both methods of exploration.

Inflammation of the uterus is recognized by special symptoms already described; it is seldom, indeed, that we do not find at least a trace of it where there is marked inflammation of the tubes. I have in fact already stated that the two affections are rarely separated. Even when the endometritis is the more serious trouble, it is often accompanied by slight ascending salpingitis, too trivial perhaps to cause any appreciable physical signs to be included in the diagnosis, or to modify the treatment in any way, and yet quite sufficient to cause sensitiveness of the appendages.

Is it possible to determine from physical examination alone, without the rational signs, the exact part played by the tube or the ovary in an oöphoro-salpingitis? In the majority of cases, this distinction cannot be made, nor is it usually necessary as regards the indications for operation.

Sclero-cystic degeneration of the ovary may exist without any marked tubal lesion; yet, as a rule, lesions of the two organs are rarely dissociated. The ovary is, as a general thing, so closely bound to the tube by adhesions that the tumor met with is tubo-ovarian. Still in a few cases we may, by means of bimanual palpation, distinguish the thickened cord-like Fallopian tube from the oblong ovarian tumor, which is by far the more movable of the two, and more detached from the edge of the uterus. It is not easy to find, and it may often be necessary to introduce both the middle and fourth fingers into the posterior and lateral culs-de-sac of the vagina; in some cases bimanual palpation with rectal touch will be better. Besides the changes in shape and mobility, an inflamed ovary is so sensitive that the lightest touch will cause the patient to cry out with pain and draw herself away. Finally, it is when ovaritis is pronounced, and especially when it is bilateral, that dysmenorrhœa is the most intense, and that one may perceive a sensible increase in the size of the tumor at the menstrual period, either because of congestion or because there is an extravasation of blood into the micro-cystic cavities.[39]

Cystic salpingitis and peri-salpingitis will be recognized by the great volume and the character and connections of the tumor which they cause. Yet it is well to know that we may meet successively at intervals of a few days, either the elongated and cord-like tumor of

acute or chronic salpingitis or the rounded and more or less diffused tumefaction produced by an acute peri-salpingitis of short duration.

Course and Prognosis.—Inflammation of the mucous membrane of the tubes is less amenable to treatment than that of the uterus. Let septic infection find a foothold in one of the many folds of the external third of the organ, and it will be inaccessible to direct therapeutic measures; if the patient recover, the cure will be spontaneous, the microbes having been destroyed. It is well known that such a result may occur in other localities; it is, therefore, reasonable to believe that it may occur here, especially if careful treatment be given to the uterine mucous membrane (anatomically and physiologically so closely connected with that of the tubes), placing a barrier about the tubal inflammation, and constantly re-enforcing the anatomical tissue elements in their struggle against the microbes. Is it possible for the cure to be complete with *restitutio ad integrum*? Most assuredly, and yet it is of rare occurrence. As a usual thing the Fallopian tube is more or less permanently impaired as a result of acute inflammation. There may be atrophy of the parts involved, as Boldt has shown; on the other hand, clinical experience demonstrates, by the persistence of the morbid symptoms when once the appendages have been subject to inflammation, how little amenable to treatment is this affection, and how serious are the after-results. The chief danger in either acute or chronic salpingitis comes from the perpetual liability to sudden attacks of peri-salpingitis (pelvic peritonitis).

The least over-exertion or change of regimen may cause an increase in severity of all the symptoms, and a decided change for the worse in the condition of the patient. Lawson Tait believes that this is caused by the entrance of a few drops of muco-pus into the peritoneum. Whether this theory be true or not, we find a peripheric puffiness due to infiltration or acute œdema of the subperitoneal cellular tissue. As a rule, rest and care bring about resolution, but relapses are frequent, may occur at intervals of months or years, and be characterized by the rapid appearance and no less rapid disappearance of circumscribed inflammatory nodules in the culs-de-sac. The feeling imparted to the hand by these nodules has caused certain authorities, who did not sufficiently examine into the anatomical conditions present, to consider them inflamed ganglia, and the names peri-uterine adenitis and lymph-adenitis have incorrectly been given to this affection.[40] There are no ganglia in this situation, consequently no adenitis; yet the œdema is doubtless found around lym-

phatic vessels and constitutes a peri-lymphangitis. It is found just above the vaginal cul-de-sac, upon the sides of the cervix, in the exact spot where Poirier has found and described a sort of network of lymphatic vessels which go from the cervix to the iliac ganglia.

Sterility is not an invariable consequence of salpingitis, which may resolve without obliteration of the ampulla; but when an old salpingitis has closed both tubes, fecundation is impossible. This, no doubt, accounts in great measure for the sterility of prostitutes.

Treatment.—Whatever may have been said to the contrary, a laparatomy or even an exploratory incision is not justified for the mere relief of persistent pain in the vicinity of the appendages. After an era of surgical excesses, especially in foreign countries, where, according to Emmet,[41] "removal of the uterine appendages has been lightly undertaken by both competent and incompetent persons," we have at last reached a point where the fruitfulness of patients is not so readily sacrificed, and where we attempt to cure rather than to extirpate.[42]

The treatment of catarrhal tubo-ovaritis is identical with that of endometritis, as that of ascending pyelo-nephritis is similar to that of the cystitis which causes it. Absolute rest, mild aperients, careful antisepsis of the vagina, prolonged and hot vaginal irrigations are the first things to be prescribed. When necessary, bleeding, if not contra-indicated, may be produced by scarifying the cervix or by leeches applied to the iliac fossa, and will greatly relieve the pain. Small blisters followed by the application of one-sixth of a grain of the chlorhydrate of morphine to the denuded surface, cauterization of the iliac region, prolonged tepid baths, injections of laudanum, valerian, chloral, may all be used for the relief of pain. As I said above, we may hope to cure salpingitis along with the endometritis providing that the lesions do not have time to become permanent. Curetting the uterus and then injecting tincture of iodine, as described at length in the chapter on Endometritis, has often done me good service in curing an incipient salpingitis.[43] Trélat[44] has obtained excellent results by following curetting with injections of creosote and glycerin. The cures reported by Walton, Gottschalk, and Doléris[45] are doubtless due more to the antiseptic treatment of endometritis than to any problematical mechanical action, and the very indirect dilatation of the ostium uterinum.

Should curetting be done when salpingitis is accompanied by acute peri-salpingitis characterized by the painful nodules in the vaginal cul-de-sac? I think not, and that it is better to wait until rest and

antiphlogistic treatment have caused a disappearance of these nodules, which occurs very rapidly when they are not encysted tumors of the Fallopian tubes. A little delay will often help in settling the question of diagnosis. To extol forced dilatation and curetting as a cure for perimetritic exudations, as Walton, of Brussels, and Poullet, of Lyons, have done, is to formulate a dangerous precept, since it presupposes that there can be no error of diagnosis. Undoubtedly curetting for endometritis may in many cases relieve or cure a serous perisalpingitis as well as the salpingitis; but in other cases it may result fatally by causing the rupture of a cyst where a pyo-salpinx exists but has not been suspected. In view of this danger, and of the fact that an exact diagnosis is often impossible, would it not be better to delay curetting until the acute manifestations have subsided and we can assure ourselves that they did not mask a collection of pus?

It is under the head of indirect treatment that we must consider the question of the value of *electricity* in some cases of salpingitis.[46]

I think the extent of its applicability has been overestimated. Encysted matter in the tubes can only be reached by puncture, which would be as dangerous with the negative pole as with a trocar. In hydro- or hemato-salpinx suppuration may be induced; in pyo-salpinx this incomplete opening may entail, not only a fistula, but septic accidents. Galvano-puncture through the vagina, if it does not penetrate into collections of pus, is very apt to produce adhesions which cause pain and complicate further operative procedures. Apart from the cases just mentioned, I see no reason why the application of the intra-uterine galvano-cautery may not cure catarrhal salpingitis by its good effects upon the endometritis. But I consider curetting with intra-uterine injections preferable on account of its greater simplicity and the greater certainty of its good results. In very nervous patients, continuous faradic currents carried into the uterus by means of the bipolar excitor may give relief. But we must proceed with great caution, and bear in mind the possible presence of pus; electrization of the uterine cavity has been known to cause the rupture of a pyo-salpinx.[47]

Massage has in the past few years been greatly praised as a method of treatment for inflammation of the uterus and appendages,[48] and like all new measures has aroused more enthusiasm than it deserves.[49] This method is by no means free from disadvantages. I think it should be used exclusively in cases of chronic salpingitis where there is no suspicion of the existence of encysted collections of

pus, for the cysts might easily be ruptured accidentally into the peritoneal cavity instead of being emptied through the ostium uterinum as the masseur desires. In acute inflammatory processes, massage does more harm than good. By friction of tissues which are friable and filled with blood, it may cause rupture and dangerous hemorrhages.[50] Yet I would advise the use of this method of treatment in the case of residues of inflammations long passed, adhesions and cicatricial contractions, which all cause pain, for the relief of which many a laparatomy has been too hastily undertaken.

Antiphlogistic massage should follow, in gynæcology, the same laws which general surgery have created for it, as, for example, in the treatment of arthritis.

If all therapeutic measures fail, after a sufficient delay we are justified in having recourse to the radical operation of oöphoro-salpingotomy.

We must not hesitate to perform it without delay when the severity of the symptoms leads us to suspect a purulent salpingitis which might rapidly threaten life. And although we should be a little more conservative in the case of chronic non-purulent tubo-ovaritis, yet the operation is not to be proscribed. These lesions, while not endangering life, render it unbearable by the almost incessant pain they cause, and the deterioration of the general health. At least six months' careful and patient treatment by the methods which I have already indicated should precede an ovariotomy for non-purulent salpingitis.

Removal of the appendages by abdominal incision, except in very exceptional cases, is a safe operation. It really includes two distinct procedures: 1st, rupture of peripheric adhesions and replacing the uterus, which is usually retroverted or retroflexed; 2d, removal of the tube and ovary as close as possible to the uterus.

Their removal by vaginal incision, praised by Gaillard Thomas, and more recently by Byford in America, which Picqué[51] has tried to introduce into France again, while suitable for special cases, seems to me to offer no advantages, but to present great difficulties if the slightest complication occur. (For a description if the operation, see pp. 319, 560, Vol. I., and p. 46, Vol. II.) The ovary must always be removed with the tube, even if it seem to be unaffected. Can we, in certain cases, limit ourselves to the first part of the operation, breaking down of the adhesions, liberation and replacement of the uterus and appendages? Hadra[52] was the first to observe that the morbid

symptoms, especially sharp abdominal pains, for the relief of which healthy ovaries have often been removed, may be relieved by merely destroying the adhesions, often filamentous, which bind together the various abdominal viscera. He therefore suggests that whenever a laparatomy is performed under these conditions, we should carefully examine the abdominal organs for adhesions, slipping the hand carefully between the loops of intestine, under the omentum, and above it. If the appendages are in a healthy condition, he contents himself with this performance; if they are diseased, he removes them.

Polk[53] goes farther than this. Having removed only one tube after going through the procedure just described, although the oviduct which was left in place showed evident signs of inflammation, he proposed the plan of simply expressing the muco-pus contained in the diseased tube, washing the peritoneum, and closing the abdomen, after having, if necessary, performed a hysteropexy to prevent a return of the retroflexion.

Mundé[54] theoretically approves of this treatment, and in addition to expressing the contents of the tubes proposes that a catheter be introduced into them and that they be washed from the abdominal end with a hot bichloride solution 1:5,000. F. Howitz[55] has also in some cases substituted the breaking down of adhesions for an ovariotomy. He reports a remarkable case where all the symptoms of chronic salpingitis were cured without a salpingotomy, although the right tube seemed to be inflamed and swollen. He lays much stress upon the pathological influence exercised by adhesions extending from the epiploön to the pubis. Many other authorities are beginning to show the same conservative tendency. J. L. Championnière[56] recently expressed himself in favor of these views at the surgical society. Terrillon[57] has performed the exploratory method once; Martin[58] did not stop with breaking down the adhesions, but opened the obliterated extremity of the tube and reconstructed the ampulla.

It is impossible as yet to give a definite opinion as to the value of these procedures. There is perhaps a danger of going from one extreme to the other, and, after having been too ready to operate, we may be in too great haste to try procedures of great ingenuity but of doubtful value. Yet the good results following simple hysteropexy after breaking down adhesions, in cases where salpingitis and perisalpingitis undoubtedly existed, plainly show that many tubes and ovaries have been needlessly sacrificed. The replacing of the uterus into position, the liberation of the appendages, and the antiseptic

cleansing of the pelvis, which necessarily attends this operation, will certainly tend to diminish the number of oöphoro-salpingotomies. We may probably reserve extirpation of the appendages for three classes of cases:

1. Ovaritis and salpingitis where there is every reason to suspect the presence of pus, and to fear the consequences.

2d. Painful sclero-cystic ovaritis.

3d. Chronic parenchymatous salpingitis and cystic (serous or hæmic) salpingitis, where, in spite of the lesions being apparently slight, menorrhagia, dysmenorrhœa, or nervous reflex phenomena call for an operation. Removal of inflamed appendages, which contain a small quantity only of mucus or muco-pus without the formation of a pouch or pyo-salpinx is not a severe operation. Conservatism is enjoined, less because of the gravity of the operation than because of the sterility which follows it.

At the end of the next chapter, I give the most recent statistical results upon the subject, in which, however, the operators have not made a careful distinction of the cases of salpingitis.

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CHAPTER III.

CYSTIC OÖPHORO-SALPINGITIS.

(*Pyo-salpinx, Hydro-salpinx, Hemato-salpinx.*)

AMONG the cystic dilatations of the Fallopian tubes, that due to accumulations of pus should have the first place. Pyo-salpinx often becomes transformed into serous or bloody cysts. When (probably from spontaneous destruction of the germs) the phlegmonous process comes to an end, an abscess in the tube may, like a cold abscess, become changed to a collection of serous matter by a clarification of the pus, the solid constituents of which are deposited upon the walls while the serum increases in amount. This seems to be the origin of the majority of cases of hydro-salpinx. The rupture of newly formed blood-vessels in the walls of the cavity of a chronic pyo-salpinx often fills it with blood.

Pathological Anatomy.—Pyo-salpinx, or purulent cyst of the Fallopian tube, is a sequel of purulent salpingitis, especially that caused by gonorrhœa or by septicæmia—the latter usually occurring post abortum.

As I have already remarked, Lawson Tait[1] and Freund[2] attach much importance to an incomplete development of the oviduct, which predisposes it to obliteration and cystic degeneration. The tube whose external extremity is closed by an agglutination and a species of intussusception of the fimbræ, is dilated for about two-thirds of its extent externally; more rarely the whole length is dilated. As a usual thing the portion nearest the uterus remains of normal size for about half an inch or an inch, but is at the same time much hardened. The ampulla often adheres to the ovary which is more or less fused in with the cyst; very rarely we may find the ampulla intact and free and projecting beyond the collection of pus, which is limited by the obliteration of the tube nearer to the uterus. Adventitious membranes adhere to the tube and ovary, which they usually bind down to the cul-de-sac of Douglas. The uterus itself is consequently frequently displaced. The left tube is, as a usual thing, the larger.

Cysts vary much in size; some have been reported to be as large as a fœtal head [3] or a cocoanut.[4]

As a rule, however, they are about the size and shape of a small pear; often they are slightly curved upon themselves, like a hunter's horn (Fig. 11), and are yellowish-white in color. The wall of the cavity varies in thickness; usually there is a weak spot corresponding to the posterior adhesions; it is difficult to avoid bursting the sac in this place when detaching it. The internal surface is velvety to the touch, the pus creamy and yellowish; it has a fetid odor when the sac is intimately connected to the rectum. Sometimes a cyst of the broad ligament, or of the ovary situated just below the

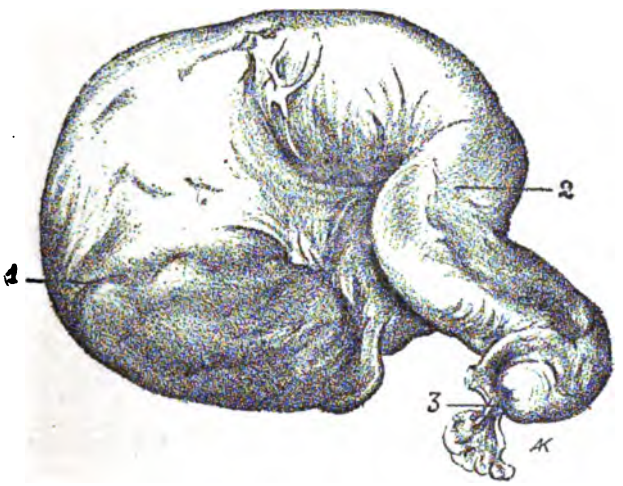


FIG. 11.—PYO-SALPINX. 1. Dilated portion of the tube formed by the obliterated distal end; no trace of the fimbriæ to be seen; 2, middle portion of tube thickened and bent; 3, proximal end of tube; below is seen the remains of an adhesion.

inflamed tube, may also suppurate, and even open into it.[5] I have myself seen an example of the first-named variety.

Under the microscope, we find the internal surface covered with branching vegetations like those of acute catarrhal salpingitis, but two or three times as thick, because of the more abundant infiltration with embryonic cells. They are covered with a single layer of columnar cells, which is also found in the bottom of the sulci which separate them.

The deep layers of the mucosa are rich in fusiform cells. Nearer to the surface is a zone of such abundant cellular infiltration that it looks like granulation tissue. The walls of the undilated portion of the tube, which to the naked eye look perfectly normal, are also in-

filtrated with embryonic cells. The blood-vessels are everywhere seen to be dilated.

In pyo-salpinx the uterine end of the tube may be still slightly permeable. It is said that the walls are thickened in this variety, when there is free evacuation. In all probability they seem so, because they are not excessively distended. It has also been asserted that the hypertrophy of the muscular fibres would then cause an evacuation of the cavity; but this is improbable; evacuation is probably caused by an overflow.

Pyo-salpinx may coexist with uterine tumors, fibroid or cancerous.

Cold abscess of the tube, or tubercular pyo-salpinx, is recognized with difficulty when there is no similar lesion of the ovary or uterus. We may, however, find characteristic tubercular granulations upon

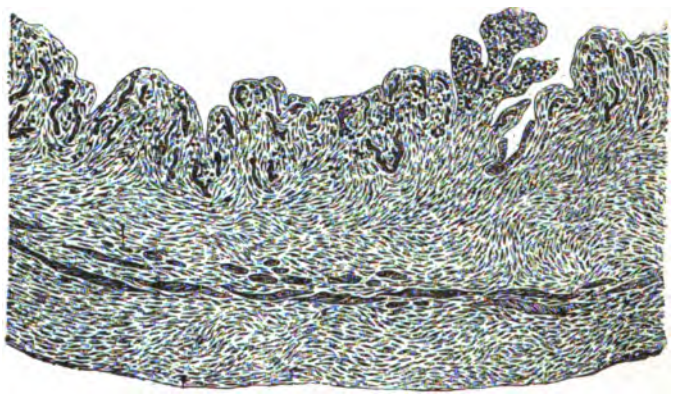


FIG. 12.—PYO-SALPINX. Section very slightly magnified. (Wyder.)

the neighboring peritoneum; as to the caseous masses found in the tube, they might be caused simply by inspissation of pus, and we know now that these apparent tubercles, to which so much importance was attached of old, are of small importance. The microscope alone can decide whether they are really tubercular, by showing the characteristic cellular features of a tuberculous follicle, with its zone of nucleated cells surrounding the giant cells, and showing, above all, the Koch bacillus. Hegar and Orthmann have met with the latter, but, like Neisser's gonococcus in gonorrhœa, it may be absent (because it has disappeared) without invalidating a diagnosis of a specific lesion. The ovary often forms an integral portion of the sac with which it is fused. In other cases, we find small abscesses scattered about in its substance, caused, no doubt, by suppuration of dropsical follicles. It may also contain a large cavity filled with pus.

Hydro-salpinx,[6] or tubal dropsy, is, from an anatomical point of view, the oldest known of the tubal affections. But, beyond doubt, many a case of tubo-ovarian cyst when the tube was not dilated but only lengthened, hypertrophied, and adherent to an ovarian cyst which opened into it, has been mistaken for hydro-salpinx. This may account for the colossal dimensions attributed to it by ancient and even modern authors (Peaslee). It is very doubtful if these tumors ever attain a greater size than that of a fœtal head. As a usual thing they are only as large as a small pear. They are smooth and bluish-white in color; the walls are transparent in places and papyraceous. There are few peripheric adventitious membranes, or, if they exist, they are thin and distended—for dropsy of the tubes always indicates an inflammation which has subsided.

Froriep,[7] who studied this lesion profoundly, divided hydrops tubæ into two varieties: aperta and occlusa, according to whether the uterine end were open or occluded. The fluid is yellowish, and sometimes contains blood or a little purulent matter.

Hæmato-salpinx[8] must be distinguished from the small hemorrhages or hæmatomata of the tube which distend its inflamed walls; these effusions of blood, which tend to reabsorption, are mere accidents rather than disease. Hæmatocele of the tube, or true hæmato-salpinx, implies a profound alteration in its walls which have assumed a definitely cystic formation, and a modification of the blood analogous to that undergone by it in hæmatocele. In one word, there is a permanent lesion, instead of the transitory pathological incident which is the real significance of an extravasation of blood into an inflamed organ. This distinction, however, not having been made by most authorities, I shall be obliged to conform to the general usage.

Leaving aside the cases of retention of the menstrual blood by atresia of the genital tract, which will be treated of in the chapter on Malformations, there remain two chief varieties of hæmato-salpinx.

1st. The first and more frequent, of which I have just been speaking, is an apoplexy of the tube, which may occur incidentally in the course of a catarrhal inflammation, or even during an irregular menstruation affected by change of *régime*, by great fatigue, or by the effect of cold in neuropathic or plethoric patients. It is not impossible that the symptoms attributed by some to a congestion of the uterus or to pelvic congestion have this origin only. The lesion is usually only temporary, the clot is reabsorbed, and the symptoms may gradually subside, unless, as is often the case, they have been

grafted upon the symptoms of a chronic parenchymatous salpingitis.

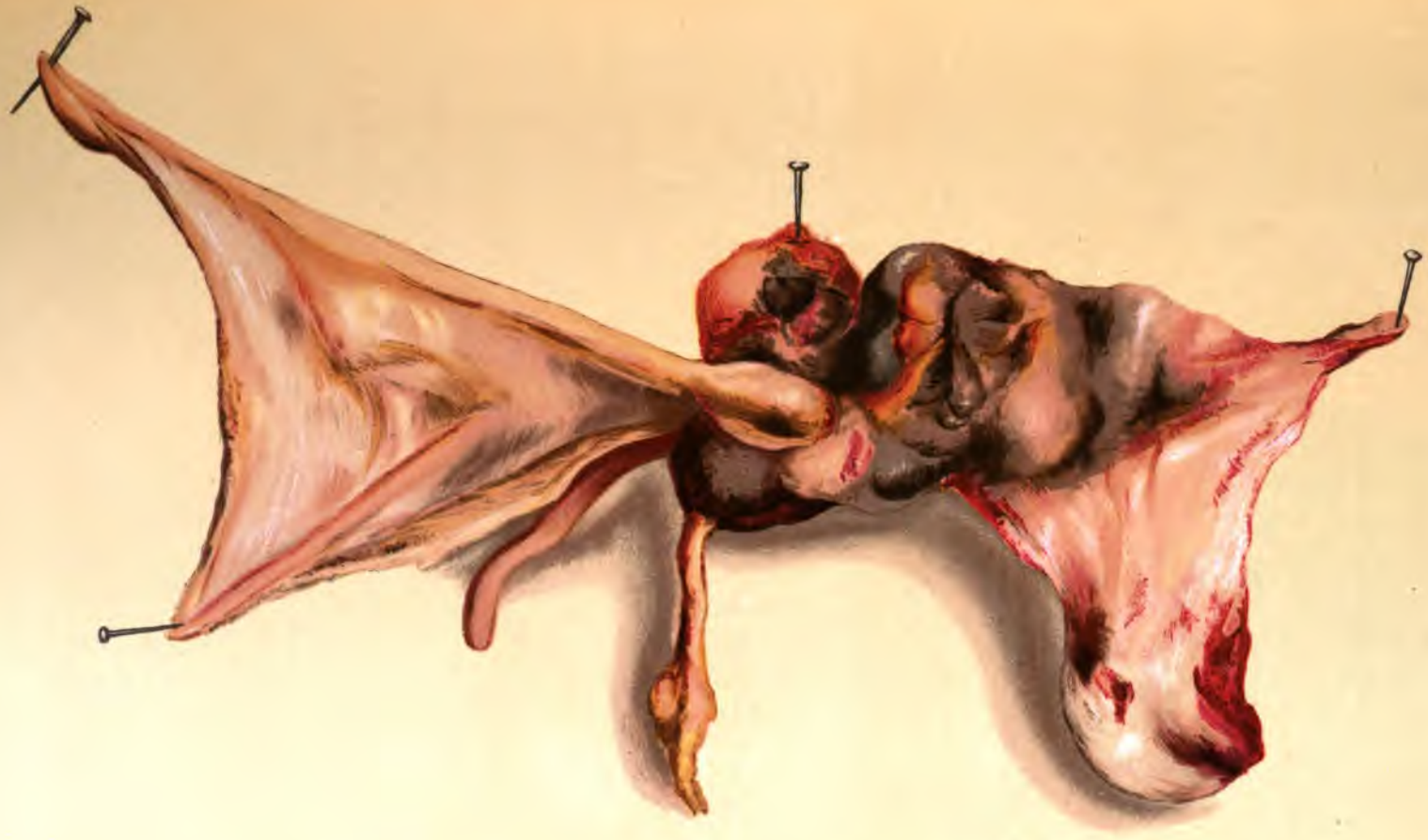
(There is no doubt that the mucosa of the tubes is the seat of an exudation of blood during menstruation. There is then a physiological hemorrhage into the tubal cavity [A. Puech] as into the uterine cavity. After an ovariotomy, when the stump of the tube is fixed to the abdominal walls, either by means of a clamp or by extra-peritoneal ligature, it is not unusual to see an oozing of blood from the cut surface at the menstrual period.[9] This physiological hemorrhage, if not constant, is certainly frequent, and is probably easily induced by anything which increases the active or passive congestion of the genital apparatus. If the hemorrhage occurs when the extremities of the tube are free, the blood will probably pass into the uterus without causing any disturbance—the physiological condition. If very abundant, it may give rise to clots in the tube, with consequent indefinite morbid phenomena, until they are reabsorbed: if still more excessive, retro-uterine hæmatocele may result.)

2d. The second variety of hæmato-salpinx, the only one which possesses a real anatomical individuality, is especially characterized by the presence of a sac like that of pyo-salpinx. For the formation of the sac I think we must presuppose a tubal pregnancy arrested in its development by the death of the fœtus, which is reabsorbed,[10] or a previous pyo-salpinx which has obliterated the uterine opening and thickened the walls at the same time that they became dilated. Sometimes there is a direct transformation from the pyo- to the hæmato-salpinx; again, there seems to be an intermediate condition of hydro-salpinx; it is in these latter cases that the fluid is the clearest and the walls the thinnest.*

Inversely, it may happen that a secondary suppuration of the hæmato-salpinx occurs; the infection is, in this case, probably carried by the lymphatics rather than through the uterine cavity, with which, indeed, all direct connection is cut off. The size of these sacs rarely exceeds that of a pear; yet Lawson Tait reports a case where one reached above the umbilicus and contained several litres. It seems to me that there must have been a coexisting encysted intra-peritoneal hæmatocele which was bound to the hæmato-salpinx.

Hæmato-salpinx is often associated with fibromata; it is not to be

[* I am indebted to Dr. Joseph Price, of Philadelphia, for the beautiful drawings of hæmato- and pyo-salpinx from which Plates I. and II. have been reproduced. B. H. W.]



HÆMATO-SALPINX SIMULATING TUBAL PREGNANCY-OCCLUSION OF TUBE AT FIMBRIATED EXTREMITY BY ADHERENT OMENTUM.- *PRICE.*

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attributed to the pressure of these tumors upon the ostium uterinum, but rather to the hemorrhagic metro-salpingitis which accompanies the development of myomata.[11]

The sac of hæmato-salpinx is thin in some places and thick in others. Hypertrophy of the muscular fibres is met with, as in pyo-salpinx. The communication with the uterus may persist. As to the contents, there may be a syrupy, chocolate-colored blood (in cases

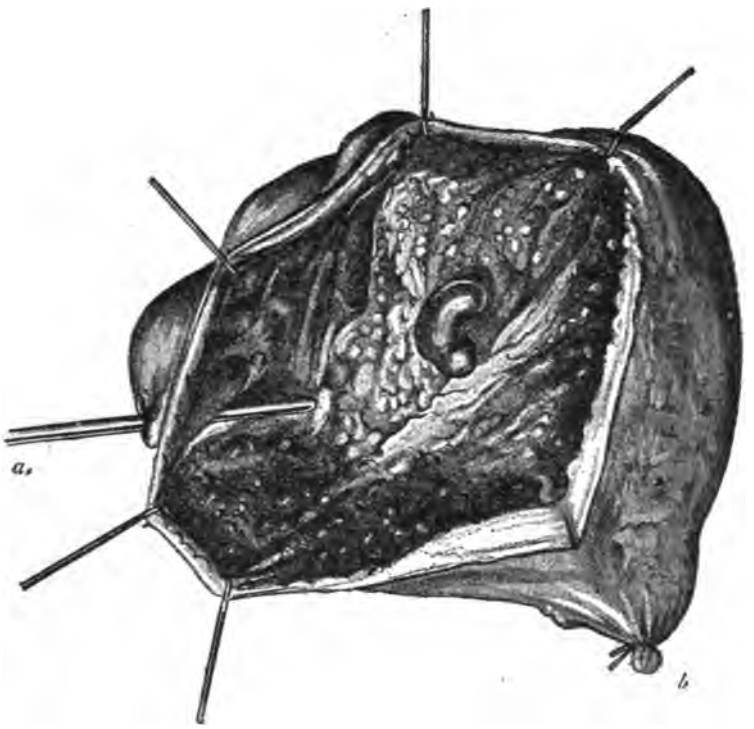

FIG. 13.—SUPPURATING HÆMATO-SALPINX. The pouch is opened, the mammillated inner surface is seen, and a small kidney-shaped body (clot or embryo?). A canula *a* is inserted in an opening which existed between the pouch and the rectum; *b*, ligature around the uterine extremity.

where the lesion is due to a retention of the menstrual flow from genital malformation) or, more often, a clearer liquid formed of a watery fluid and blood or of pus and blood. Clots may form in layers on the walls, or in little fibrous masses which are free[12] (Fig. 13). A microscopical examination of the sac shows an irritative process less severe than in pyo-salpinx. But there is an unusual abundance of the fusiform cells in the mucous membrane, which in some of the folds seem to rise perpendicularly from the deeper layer. The top of these folds has usually lost its epithelial coating; the intervals be-

tween them may contain a dense network of capillaries filled with blood, that can be traced almost to the surface of the mucous membrane. In places small parenchymatous hemorrhages hide the structure of the tissues (Fig. 14).

Symptoms.—It may seem singular, *à priori*, to attempt to give at the same time the clinical picture of collections of pus and of collections of serum and blood. If one had not verified the fact by actual observation, it would be difficult to believe that a patient might be carrying about in her abdomen two sacs filled with pus without exhibiting any serious phenomena or even seeming to suffer from their presence. Between the initial period of formation and the final period of inflammation of surrounding parts, and efforts at spontaneous evac-

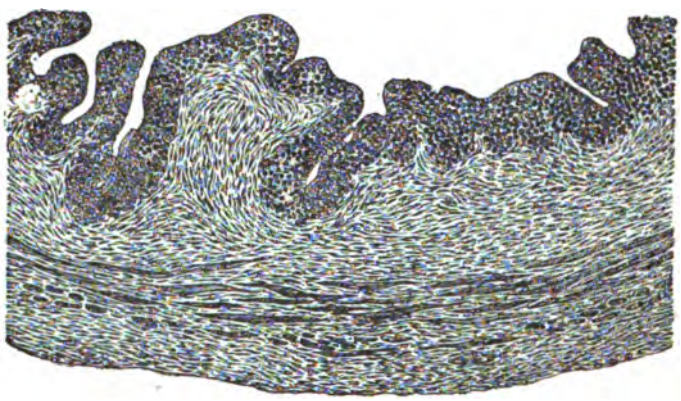

FIG. 14.—HEMATO-SALPINX. Section slightly magnified. (Wyder.)

uation, pyo-salpinx passes through a torpid and latent phase, so to speak, during which the economy which is perfectly protected by the encysting of the septic fluid seems to acquire tolerance for its presence;[13] the rational symptoms then seem to be exactly similar to those of chronic salpingitis, and the physical signs are in nowise different from those of hydro- or hæmato-salpinx. We are thus justified in treating of the symptoms under one head, only adding a few special ones which characterize the acute stage of tubal abscess.

This clinical picture does not materially differ from the one which I drew for non-cystic salpingitis. There are the same pains and the same menstrual disorders (amenorrhœa, dysmenorrhœa, menorrhagia); the latter, however, may not occur, and menstruation be perfectly normal.[14] In hæmato-salpinx, Puech has sometimes noticed a constant dribbling of small quantities of blood instead of real menses; this is

what some call *amenorrhœa distilane;* it is not pathognomonic, and is met with in endometritis as well.

I must not fail to mention another accessory symptom, to which altogether too much importance has been attributed; I mean the sudden flow of a certain amount of serous, bloody, or purulent fluid following an attack of colicky pain; this may occur at irregular intervals of a month or six months. Has it anything to do with the permeability of the uterine orifice, now and then forced open by the overflowing of the overfilled cyst? Or is there merely an expulsion of the contents of the uterus, which is itself inflamed, caused by reflex contraction of its walls? We shall be tempted to accept the latter explanation if we remember how frequently the cystic tubes are obliterated at the uterine extremity. However that may be, the fact has long been noticed; it constitutes the hydrops tubæ profluens of Froriep. Klob, having examined and studied many aged patients, thinks that this may account for certain cases claimed to be a return of the menstrual function after the menopause.[15] Sometimes by pressing upon the tumor from above, its contents are expelled into the vagina.[16] This flow of pus caused by abdominal pressure, or pyometrorrhagia, has often been considered a sure symptom of pyosalpinx.

Two groups of symptoms only are really characteristic: The pains which direct attention to the uterine appendages; and a local examination which results in the finding of a tumor at the side of the uterus.

The physical examination will be made by means of bimanual palpation and rectal touch. It is to be undertaken with great precaution; serious and even fatal accidents have been caused by rupture of a pyo-salpinx from too rough an examination. Cystic tumor of the tubes varies greatly in its character according to whether it is free and to a certain extent movable by the side of the uterus, or whether it has fallen into the cul-de-sac of Douglas and become fixed there by adhesions.

The first case is the typical one; with both hands we can grasp a small pear-shaped body, which hangs upon the side of the uterus to which it is connected by a slender pedicle which we can scarcely reach. When the tumor is bilateral, it seems as if a wallet had been thrown over the uterus, saddle-bag fashion. Fluctuation is rarely felt, but pain is always caused by the examination if the patient be not anæsthetized. In some cases we find the cyst upon one side,

while the cul-de-sac of the other side and Douglas' pouch are filled by an elastic or fluctuating globular mass which seems incorporated with the posterior surface of the uterus. This is one of the tubes, dilated to the shape of a retort, which has fallen into the cul-de-sac, uplifts the uterus, and presses down the rectum. It is usually purulent and non-movable; at first it is free, but gradually becomes so adherent to surrounding parts that it becomes transformed into a veritable pelvic abscess which cannot be enucleated.

Diagnosis.—Can we always distinguish pyo-salpinx from serous or hæmatic tubal cysts? I have already spoken of the extreme caution to be observed in this diagnosis, and of the tolerance acquired by the system for the presence of a sharply limited collection of pus.

Pyo-salpinx is to be suspected if the dilatation of the oviduct follow gonorrhœal or puerpero-gonorrhœal infection, and if the tumor be very closely adherent. If temporary or permanent purulent fistulæ are found, there is no room for doubt. There only remains the question of exact location to decide, and the possibility of a transformation into a pelvic abscess. In doubtful cases only abdominal section can give the answer.

Hydro-salpinx and pyo-salpinx are usually double, while hæmato-salpinx is unilateral.[17] It would be pertinent to inquire whether this be not due to the fact that it is caused by an arrested tubal pregnancy.

There may be a purulent mass upon one side and a fluid mass upon the other. If the tubal mass be of large size and there be no extensive adhesions, we probably have to do with a hydro-salpinx; pressure is less painful than in the case of a purulent cyst.

While the tumor is still movable, we may mistake it for a small ovarian cyst, and especially for an intra-ligamentous cyst. The latter, however, is more decidedly lateral, and is not usually separated from the uterus by the space corresponding to the pedicle of the tubal cyst.

The differential diagnosis from tubal pregnancy in the first four months is almost impossible to make with certainty. In the majority of cases where these fœtal cysts have been extirpated, the operation had been undertaken for a supposed salpingitis. Hypertrophy of the uterus and expulsion of a decidual membrane are the only diagnostic symptoms. Menstruation may continue to be normal.

An inexperienced examiner is very apt to mistake large serous or bloody cysts for uterine fibromata, and it is indeed often very difficult at first to distinguish the one from the other. But the uterine

FIG. 1. PYO-SALPINX.

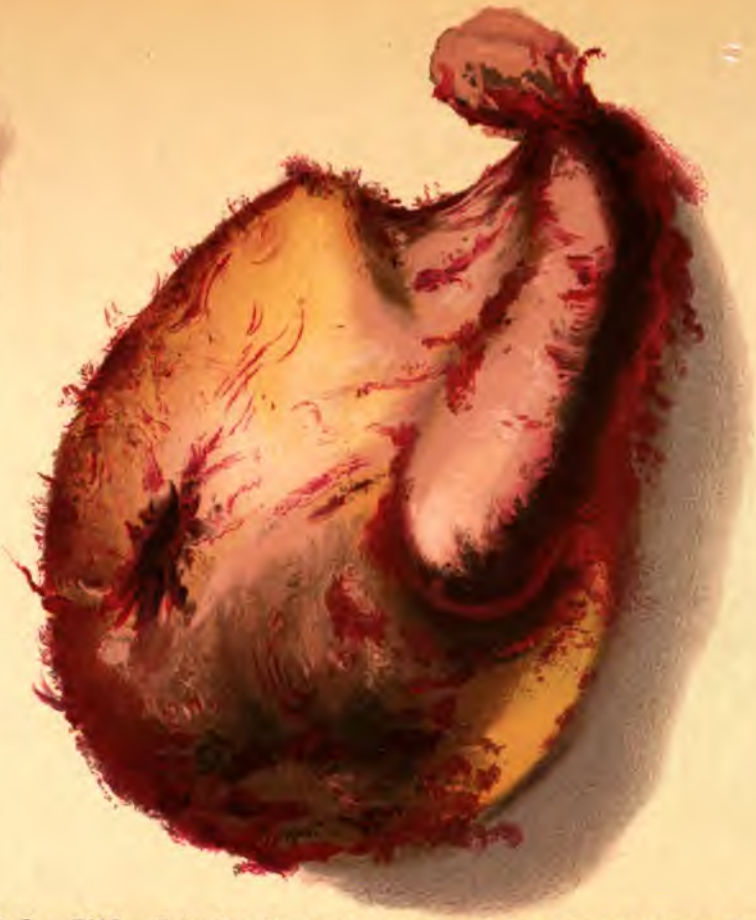

FIG. 2. PYO-SALPINX AND OVARIAN ABSCESS, BOTH SHOWING UNIVERSAL ADHESIONS.

PRICE.

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sound, carefully used, will show a great increase in the uterine cavity when there is a fibroid, and a normal cavity in the case of the tubal affection. Moreover, we may always perceive fluctuation in hydro- and hæmato-salpinx if they be of any size, or if the patient be anæsthetized: it is surprising how different the sensation imparted is from that felt before the anæsthetic was administered. Pyo-salpinx with adhesions projecting into the cul-de-sac of Douglas often give the sensation of a pasteboard vagina.

Is it permissible to make an exploratory puncture for the sake of clearing up a diagnosis? It seems to me a dangerous procedure, however far the tumor may be from the point of puncture; whether it be abdominal or vaginal. There is danger of wounding the intestines; especial danger of an effusion of septic fluid in the peritoneum, either primarily if in spite of aspiration the evacuation has not been thoroughly accomplished, or, secondarily, if the cyst is again filled and forces open the lips of the small wound. This exploration, which seems so trifling to the patient and her friends, is in reality much more serious than an incision under antiseptic conditions. Certainly the latter is not to be lightly undertaken; still, we should not forget that it constitutes one of the most valuable of surgical resources.[1]

The differential diagnosis between a large cyst of the tube, and fibro-cystic tumor of the uterus, is in some cases almost impossible; yet the increased size of the uterine cavity, as demonstrated by the use of the sound, will determine the question. In this case exploratory puncture would be especially dangerous.[19]

Pelvic adenitis, which is of rare occurrence and of obscure origin, may occasion errors of diagnosis. The rational symptoms to which it gives rise, and the tumor which it forms, resemble pyo-salpinx with adhesions. Tenier mentions an interesting case of this kind. L. Championnière and I have also seen similar ones.[20] Pregnancy complicated with a bilateral pyo-salpinx has been observed, and the peculiar condition caused was understood only after an exploratory laparatomy.[21]

Doléris[22] mentions two interesting cases of adherent enterocele in Douglas' cul-de-sac, where the pain and the physical signs pointed to an inflammatory tumor of the appendages. The mass felt behind the uterus was formed of loops of intestines agglutinated together by false membranes. The tubes and ovaries were in an almost normal condition. These seem to be examples of pelvic peritonitis of intestinal origin, very seldom met with, and only possible to diagnose by laparatomy. Removal of the appendages gave no relief.

Course, Duration, Termination, Prognosis.—We may assert that these cysts of the tube constitute a definite disease, which is incurable except by extirpation. The patients become chronic invalids, in whom the least over-exertion brings on acute attacks of peri-salpingitis; so that the course of the disease is marked by constant relapses, just as in peri-uterine phlegmon and pelvic peritonitis. In fact, until recently tubal lesions were indiscriminately classified with the inflammatory processes of which they are the cause. The acute attacks in the case of non-purulent tumors are characterized by an exacerbation of the pain and the nervous symptoms and by a remittent type of fever. Tait attributes these repeated attacks to the exit of a few drops of irritating fluid through small openings in the tube.[23] However that may be, it is certain that there are constantly recurring attacks of peri-salpingitis, which may finally result in rupture. If this occur to a serous or a blood cyst, the result may be comparatively harmless[24] (as in the case of rupture of the ovary).

But if a pyo-salpinx opens and discharges into the peritoneal cavity, the most formidable results follow, of which the cause is often not recognized. The medico-legal adviser should be informed of the possibility of these sudden deaths which may carry off patients in apparently good health; in their unexpected severity these cases are comparable to the rupture of extra-uterine pregnancy. When the evacuation of pus is prevented by the obliteration of the uterine opening, and its formation still continues, the pus distends the cavity so enormously that it comes into contact with neighboring cavities, rectal or vaginal, and adheres to them; perforation follows, with evacuation of the pus. The opening tends to become permanent, and fistulæ are thus formed which usually communicate with the rectum, as the pyo-salpinx usually prolapses into the cul-de-sac of Doulgas. More rarely the pus finds its way into the vagina or bladder. Shooting pains, tenesmus, and glairy diarrhœa (Nonat) precede the opening into the rectum; signs of cystitis announce the opening into the bladder. Recto-vesical communication may be established by a double perforation.

These fistulæ are usually intermittent. After a febrile stage and premonitory pains, the pus is suddenly evacuated. Instantaneous relief follows, the patient, who often seemed at the last gasp, comes to life again, and seems almost to be cured, until the advent of another sharp attack exhausts her again. These alternations of pain and relief may last for a long time without greatly impairing the general

health. In some cases the attacks assume a septicæmic character, the temperature rises to 106° F., violent chills, delirium, a pronounced alteration of the facies indicate the intensity of the infection. After a few of these attacks the patient is much enfeebled, and subject to an exhausting though slight hectic fever. Unconquerable anorexia is one of the most striking features of this morbid state; some patients cannot take the slightest nourishment; everything is rejected, and they finally die of inanition.

Another clinical type exists, in which the fistula, whether permanent or intermittent, causes scarcely any reaction, but brings about a gradual deterioration of the system.

The suppurating Fallopian tube may open laterally into the iliac fossa, giving rise to abscess in this region, or, in front, into the prevesical cellular tissue, causing a special form of suppuration in the cavity of Retzius. These lesions, which will be carefully considered in the following chapter, belong more to the category of pelvic abscesses than of circumscribed inflammations.

When a partial cure is spontaneously effected, the plastic residues which bind down and displace the uterus and its appendages are a constant source of pain, and continually menace a return of acute inflammation. Moreover, the tubes, even after the evacuation of their contents, are subject to an interstitial salpingitis, at first hypertrophic and finally atrophic, which causes persistence of the pain.

Treatment.—"Many diseases which are the despair of medical practice are easily cured by the help of surgery," wrote Louis [25] more than a century ago. These words were never more strikingly illustrated than in tubal affections. Only a few years ago women thus diseased were treated upon the expectant plan, and condemned to a perpetual state of invalidism or to a lingering and painful death. Now surgery affords an almost certain means of cure.

Can we in these cases employ the indirect treatment which I recommended in the case of non-cystic salpingitis? Many good authorities, Walton first, then Doléris, Gottschalk, etc.,[26] thought it well to expel the fluid in the tubal cavity by reopening the uterine orifice by curetting and dilating the uterus. If we remember the pathological anatomy of these lesions, the complete and permanent obliteration of the calibre of the tubes in the majority of cases, we shall see how illusory are the hopes of success in this direction. The relief and cure obtained after this treatment must certainly belong to serous peri-salpingitis, which has been mistaken for pyo-salpinx. It is

scarcely worth while even to mention the plan of evacuating the tubes by means of a catheter. There is danger in penetrating into a healthy tube,[27] and in the case of a diseased organ it would certainly be dangerous.

As soon as the diagnosis of a cyst of the tube is established, we must remove the diseased parts, choosing the best moment for the operation. If possible we should not operate during an acute attack. Yet if it be of so serious a character as to threaten general peritonitis, or if there be danger of rupture of the pyo-salpinx, the abdomen must be opened without delay, as it is the only way to save the patient.

The operation of oöphoro-salpingotomy under these conditions is far more difficult than when done for simple catarrhal salpingitis. The great number of adhesions and the danger of perforating a cavity full of fluid that may infect the peritoneal cavity, call for the utmost precautions. The incision is usually larger than is ordinarily the case for ovariotomies. We often find the omentum adhering to the pubis and covered with bullæ (acute œdema) which completely change its appearance. This is to be detached by the fingers covered with gauze compresses, and if it be much altered, resected, in small sections after a careful application of catgut ligatures. With the fingers we then find the fundus of the uterus, and follow its upper surface outward to the tubes and ovaries. As soon as we have found which tube is the more diseased, we try to pass our fingers around the tumor, detaching it, if it be adherent, and insinuating the finger between it and the adjacent organs. If the sac be very large, and its walls thin, we must avert all danger of rupturing it, by aspirating its contents with Potain's or Dieulafoy's apparatus, closing the small opening made by the needle with one or two forcipressure forceps. If the tumor be small, firm, and resistant, we would better carefully detach it without emptying it; this gives a better grasp to the fingers. When the tumor is freed, and is no longer fastened to the broad ligament except by the alae of the tube and ovary, we transfix this membranous pedicle by means of a blunt needle threaded with silk, and we tie it with a Lawson-Tait knot or, if the pedicle be too large for this, with two crossed threads, or a series of linked ligatures. If adhesions interfere with the first loosening of a cystic tube fixed to the cul-de-sac of Douglas, we may facilitate matters by cutting the tube between two ligatures at about half an inch from the uterus, which is a situation where the tube is usually but slightly affected and not at all dilated, and forms a real pedicle. We then detach the

adhesions from within outward instead of from without inward. I must call attention to the fact that there may be an adhesion of the tumor to the vermiform appendix. If the latter be mistaken for the pedicle, it might be a dangerous error.

The surface of the cut section of the tube should be cauterized with the thermo-cautery as an antiseptic precaution, for there is always a small hernia of diseased mucosa in the centre of the stump.

When much difficulty is experienced in isolating the adherent tube, there is a natural desire to enlarge the wound in order to be able to see as well as to feel. Lawson Tait, who has an unparallelled experience in operations, strongly condemns this procedure. He advises an absolute reliance upon the sense of touch, and decries a further complicating of the operation by the necessity of replacing the intestines and drawing together the often resistant lips of a lax abdominal wound. If, when we come to ligate the pedicle, we find that it is large, stretched, and inelastic, and is in danger of being torn by the traction necessary to bring it within reach of the instruments, or of being cut by the constricting threads, Lawson Tait recommends the following procedure to relax it somewhat: he slips his fingers along the broad ligament as far as its attachment to the pelvis, then by scratching with his nails he produces some small wounds of the serous fibres of the ligament. These scratches do not affect the blood-vessels, which escape because of their elasticity and mobility. The broad ligament is thus given more freedom of motion, and the pedicle can be more readily drawn to the wound, and tied without tearing or cutting it.[23]

The best method of arresting hemorrhages during these operations is by compression. I accomplish it exclusively by means of the gauze compresses. The operation is suspended for a moment, and with both hands we press firmly down upon the mass of compresses which fills in the wound. Hemorrhage caused by detaching a tumor fixed in the cul-de-sac of Douglas can readily be stopped by this means. That due to a tear of the edges of the uterus may persist; but a row of catgut stitches will control it. Irrigation with hot water, or the application of the thermo-cautery may be tried when necessary. Only in case of absolute necessity should we have recourse to hæmostatic tamponade of the peritoneal cavity with iodoform gauze, or even to permanent forcipressure, which is the *ultima ratio.* In the latter case, capillary drainage should be employed by covering the forceps with pieces of iodoform gauze. Some surgeons have even had to re-

sort to hysterectomy to obtain hæmostasis in cases where the hemorrhage was caused by uterine adhesions.

If there has been an effusion of pus or of irritating fluid into the abdomen, the cavity should be washed out, and if the manœuvres have been very painful, and there is any reason to fear much oozing from extensive lacerations, drainage or antiseptic tamponade of the peritoneal cavity should be resorted to (pp. 22, 69, 74, Vol. I.). I make it a rule to observe this last precaution whenever there is a fistula; the latter usually closes soon after the operation, without infecting the peritoneum. If there should be delay in the closure, the tamponade will sufficiently protect the serous cavity.[29]

Shall we, as a matter of routine, remove both tubes, even when only one is diseased, because of predisposition to disease on the part of the other? This seems to be a needless sacrifice of the possible fruitfulness of the patient, and it would be better to let her run the chance of a second operation. Few surgeons are as radical upon this point as Tait. Surgery of the tubes, having passed through a period of absolute temerity, would seem to be entering upon one of conservatism. I have already noted (p. 23) the practice of some operators who content themselves with breaking down the adhesions, and treating the pelvic cavity antiseptically in cases where a laparatomy has shown only a small amount of disease of the appendages. Martin[30] has at times simply opened the ampulla by pushing apart the agglutinated fimbriæ. In some cases of hydro-salpinx he went farther, and resected a portion of the sac, and sutured the internal to the external wall in such a way as to make a permanent opening, an artificial ampulla which made fecundation possible. Skutsch[31] reports an operation of this nature, to which he proposes giving the name of salpingostomy. Instead of extirpating the tube, which is transformed into a serous cyst, he ascertains the nature of the contents by aspiratory puncture, opens the abdominal extremity, excises an oval piece about half an inch wide, and by means of silk sutures unites the mucous and serous membranes around the opening. The permeability of the tube is ascertained by passing a sound through it. Skutsch wonders whether in such cases it would not be better to suture the new ampulla to the ovary.

Assuredly, if such an operation offered a real chance of curing sterility, it might be worth while to resort to it, although it is longer, more difficult, and even more dangerous than salpingotomy. But it is doubtful whether this happy result could be obtained, for we must

not lose sight of the fact that the very structure of the organ is affected, and that permeability alone will not assure a proper performance of its functions. After seven such operations, Martin has not observed any subsequent impregnation.

We must remember that the good effects of removal of the ovary and tubes may not be felt for weeks or even months. During this time the patient may continue to suffer abdominal pains which, though certainly less severe than before, discourage her by causing a belief that the operation has not attained the hoped-for result.[32]

These phenomena are to be attributed to two causes: 1st, the irritation of the peritoneum near the ligature, which being upon inflamed tissue produces a certain amount of peripheric reaction; 2d, the persistence of inflammation in the stump of tube left in place. I think that we should always remove as much as possible of the tube, leaving attached to the uterus only the amount necessary to insure a firm ligature. Finally, every operation upon the tubes should be followed by curetting of the uterus, and injections of iodine solutions, to modify the accompanying endometritis, and at the same time cure the inflammation of the tubal stump. I usually practise this curetting about a month after the operation.

The menopause does not always follow at once after removal of both tubes and ovaries (p. 549, Vol. I.). The persistence of the menses for any length of time seems often to depend upon a lesion of the mucosa (endometritis, etc.) that plays the part of an irritating body in the uterus; hence the value of the subsequent local treatment I have advised. Removal of the tubes alone, however, does not cause a cessation of the menses; although Tait gives these organs the chief rôle in the menstrual function. But salpingotomy without oöphorectomy will cause sterility.

Gravity of the Operation (oöphoro-salpingotomy for inflammatory lesions, Tait's operation). In order that the statistics be of real value in assisting us to form an opinion as to the gravity of the operation, they should be made in conformity with the following classification:

1st. Acute catarrhal, non-suppurative salpingitis.

2d. Suppurative salpingitis—*a*, non-cystic; *b*, cystic which can be enucleated; *c*, cystic which cannot be enucleated.

3d. Chronic salpingitis (hypertrophic and atrophic).

4th. Cystic (serous or bloody) salpingitis (hydro-salpinx, hæmato-salpinx).

Unfortunately but few of the published records are careful to make these distinctions; still we are able to assert, from what we know, that the operation is usually beneficial. In the case of pyo-salpinx it is serious, but becomes of great gravity only when the suppurative process has invaded the cellular tissue and peritoneum. The presence of a pus fistula, even where the abscess is sharply limited and can be enucleated, is sufficient in itself to greatly impair the prognosis. The general condition of the patient, too, calls for careful consideration; oftentimes exhaustion is so great that an operation performed *in extremis* has small chance of succeeding. Yet we have seen cases that might be called absolute resurrections, and no surgeon has a right to refuse to give a patient this last chance of life.

I will quote a few of the most recently reported cases.

Meinert[33] has had 13 cures out of 14 operations. [Mundé[34] in 81 consecutive operations had no death.] Out of 41 cases Imlach[35] had 3 deaths. Lawson Tait,[36] out of 63, 1 death. Orthmann reports 21 cases with 2 deaths.[37] Schlesinger[38] has gathered together the reports of 274 laparatomies for tubal inflammations, and estimates the fatal results at 8.76%. A. Martin[39] reports 72 cases with 12 deaths. Westermark[40] removed the tubes 10 times with 1 death; he estimates that out of 498 cases performed by 8 operators there were 41 deaths (8%). Skene Keith[41] performed 23 operations in six months without one failure.

This series of operations includes lesions of various grades of severity. The most brilliant record of operations relating to pyo-salpinx alone belongs to Gusserow,[42] 29 cures out of 30 cases.

In France, removal of inflamed tubes has frequently been done of late years. Terrillon[43] reports 6 cures out of 6 salpingotomies for catarrhal salpingitis. In one of them the operation was unilateral.

In cases of cystic salpingitis, Terrillon had the following results: 2 hydro-salpinx, cured; 5 hæmato-salpinx, cured; 14 cases of removal for pyo-salpinx with 13 cures. (Five of the cases, when there were more or less adhesions, were treated by incision and suture to the abdominal walls; a cure followed, but, in two cases, only after the persistence of fistulæ for several months.)

In a recent discussion before the Surgical Society, many smaller series of cases were reported.[44] Routier, out of 13 cases of pyo-salpinx, had 3 deaths; 1 operation for hydro-salpinx, 1 death. In this last case the adhesions were so extensive as almost to prevent the comple-

tion of the operation. Terrier had 3 cures out of 4 operations for pyo-salpinx; and 1 hæmato-salpinx, with cure. Quénu had 4 successful results out of 4 salpingotomies for tubal inflammations, of which 3 were suppurative. J. L. Championnière[45] gives the following report: 65 removals of the appendages and 10 liberations of adhesions with 1 death only. It is to be regretted that in so important a series of operations the lesions should not have been more carefully classified, permitting of a more exact appreciation of the gravity of each, and the surgical value of the operative results obtained.

In conclusion, the mortality is low in the case of catarrhal salpingitis, but increases where we have to do with pyo-salpinx or even with hydro- or hemato-salpinx, in which the presence of adhesions greatly complicates matters. Even then, however, fatal results are relatively infrequent and quite out of proportion to the exceeding danger of the expectant plan of treatment.

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4. J. W. Elliot: Boston Med. and Surg. Jour., April 21st, 1887.

5. J. W. Elliot: A Case of Chronic Salpingitis; Tubo-Ovarian Cyst Acutely Inflamed; Hemorrhage into the Cyst. Amer. Jour. of Obstet., vol. xxiv., p. 141, February, 1887 (with illustrations).

6. Nearly two centuries ago Abraham Cyprianus in a letter relating the history of a human fœtus of 21 months, Amsterdam, 1707, p. 22, shows a good illustration of hydro-salpinx. This lesion was found upon the cadaver of a woman in whom sterility followed a complicated labor. According to Greig Smith (Abdominal Surgery, p. 157, foot-note), an analogous illustration is found in Dekker's Exercitationes Practicæ, Leyden, 1695.

7. Froriep: Beob. einer Sackwassersucht der Fallop. Tromp. Medic. Zeits. d. Ver. f. Heilk., 1834, No. 1.

8. Beraud was one of the first to make an anatomical study of hæmato-salpinx. Becquerel: Traité Clinique des Maladies de l'Utérus, 1859, vol. ii., 280.

9. Spencer Wells: Diagnostic et Traitement des Tumeurs Abdominales, French trans., 1886, p. 168. Poncet: Thèse de Paris, 1878, p. 28. Prewit: Amer. Jour. of Medical Sciences, April, 1876. Lawson Tait: British Medical Journal, 1878, p. 933. Migrew: Amer. Jour. of Obstet., Sept., 1884, p. 912.

10. Martin (Centr. f. Gyn., 1889, No. 40) exhibited in the 62d Meeting of German Naturalists and Physicians, Heidelberg, a specimen of hæmato-salpinx, in which, though all other traces of a fœtus were absent, he had been able to discover chori-

onic villi. These should always be carefully sought, before giving an opinion upon the nature of the tubal sac.

11. Von Campe: Verhandl. der. Berl. Gesell. f. Geb. und Gyn., 1883. Wyder: Archiv f. Gyn., vol. xii., p. 35.

12. Riskallah: Paris Thesis, 1889, Obs. 5.

13. Lawson Tait (British Med. Journal, June 4th, 1887) tells of an operation performed upon the wife of a professional brother. He removed a bilateral pyo-salpinx which was upon the very point of rupture, and which would probably have killed the patient within the week, although she had been conscious of no suffering, and her husband was with great difficulty persuaded to allow the operation.

14. L. Championnière: Bull. de la Soc. de Chir., Jan. 18th and Feb. 8th, 1888.

15. Becquerel (Traité Clinique des Maladies de l'Utérus, 1859, vol. ii., p. 279) reports three such cases among the old women at the Salpêtrière.

16. Hausamann (quoted by Guemez, Thèse de Paris, 1887, p. 64) has published the report of such an occurrence in a young girl, for a hæmato-salpinx observed by Frankenhäuser. Routier reported a case of pyo-salpinx which seemed to be evacuated by pressure. Bull. Soc. de Chirurg., Oct. 12th, 1887.

17. C. Hennig: Die Krankheiten der Eileiter, Stuttgart, 1876.

18. Lawson Tait, in a meeting at the Jefferson Medical College, September 15th, 1884, said: "Experience has taught me that it is a surgical crime to permit a patient to go to her grave without an operation if it hold out any hope of relief." L. Tait makes a small incision, 1½ to 2 inches and sufficiently large for the introduction of one or two fingers; the exploration is to be made entirely by touch and not by sight. Gaillard Thomas (Medical News, Philadelphia, Dec., 1886), in an article entitled, Laparatomy as a Means of Diagnosis, expresses the same idea as Lawson Tait. He would have one write upon the walls of every hospital where laparatomies are performed, this aphorism, "When any doubt exists as to the diagnosis of an abdominal neoplasm causing serious trouble, or to an obscure morbid condition of the abdominal cavity threatening life, give the patient the benefit of an exploratory incision." See also on this subject, Joseph Price: Obstetric Soc. of Phila., April, 1887, in American Journal of Obstetrics, xx., p. 749.

19. Schröder: Die Krankheiten der weibl. Geschlechtsorg., 1886, p. 243.

20. S. Pozzi: Bull. de la Soc. de Chirurg., April 14th, 1886, p. 300. Terrier, L. Championnière: Ibidem, June 26th, 1889.

21. Sacré: Soc. Obstet. et Gyn. de Bruxelles, July 21st, 1889. Centr. f. Gyn., 1889, No. 39. Porro's operation. Recovery.

22. Doléris: Quelques Points de Diagnostic Differ. de l'Oöphoro-Salpingite. Nouv. Arch. d'Obst. et de Gyn., August, 1889.

23. Lawson Tait: Traité des Maladies des Ovaires, French trans. by Olivier, 1886, pp. 92, 150.

24. There has, however, been reported a case of death from rupture of hydro-salpinx, following dilatation of the cervix and artificial prolapse of the uterus. A. Mermann: Centr. f. Gyn., 1881, p. 513.

25. Louis: Mémoires de l'Académie Royale de Chirurgie, 1784, vol. xiv., p. 138.

26. Walton: Contribution à l'Étude de la Pelvi-péritonite, son Traitement par la Dilatation Forcée et le Curettage de l'Utérus. Mémoire Presenté à l'Académie Roy. de Méd. de Belgique, le 30 Juillet, 1887, et Publié dans les Mémoires Couronnés, tome viii., 1888. Du Drainage de la Cavité Utérine en cas d'Abscés Pelvien. Annales et Bull. de la Soc. de Méd. de Gand, 1888, p. 102. Walton basis his therapeutical propositions upon a rather doubtful experiment made with a hollow rubber ball which he dilates by means of a Gariel pessary. The application which he makes of it to pathological conditions is indefensible. Doléris (Comptes Rendus de la Soc. de Biologie, December 21st, 1888) repeats the preceding ideas. In a more

detailed article (Journal de Médecine de Paris, 1889, Nos. 7 and 9) he reports some experiments made upon the cadaver and upon pathological specimens which are little calculated to carry conviction as to the merits of the procedure. Gottschalk: Zur Behandlung der Pyosalpinx. Deutsche Medicinal-Zeitung, 1889, No. 30.

27. A. Martin: Arch. f. Gyn., 1884, p. 305.

28. Greig Smith: Abdominal Surgery, London, 1887, p. 170.

29. S. Pozzi, Lostalot-Bachoué, and Baudron: Clinical Observations of a Series of Thirty Laparatomies. Annales de Gynécol., May, 1890.

30. A. Martin: Ueber partielle Ovarien- und Tubenextirpation. Volkmann's klin. Vorträge, No. 343, 1889.

31. Skutsch: Beiträge z. operat. Therap. der Tubenerkrankungen. 3d Congress of German Gyn., Freiburg, 1889. Centr. f. Gyn., 1889, No. 32.

32. Steel: Liverpool Med. Journal, 1886. Coe: American Journal of Obstet., 1886, p. 561.

33. Meinert: Centr. f. Gyn., 1886, No. 45.

34. Mundé: A Year's Work in Laparatomy. Amer. Journal of Obstet., xxi., p. 33, reports 14 cases with 1 death. He gives the details of 3 cases: 1 pyo-salpinx (drainage; cure); 1 hæmato-salpinx (washing; cure); 1 hæmatoma of both ovaries which burst during the operation (washing, drainage; cure). [In a personal communication to the Editor on Nov. 11th, 1891, Mundé reported 129 consecutive laparatomies for ovarian tumor, salpingo-oöphoritis, and pyo-salpinx, with 3 deaths; 1 in a case of intra-ligamentous abscess, and 2 of intra-ligamentous cysts. In this series there were 81 consecutive operations without a death.]

35. Imlach: Liverpool Med. Surg. Jour., quoted in Lancet, Oct. 30th, 1886. Two patients upon whom he had performed unilateral removal of the tube, subsequently became pregnant and were safely delivered.

36. Lawson Tait: British Med. Jour., April 16th, 1887. A recent report bringing his laparatomies up to 2,000 gives 263 removals of inflamed appendages with 9 deaths. Bulletin Médical, Nov. 7th, 1889.

37. Orthmann: Virchow's Archiv, Heft 1, 1887.

38. Schlesinger: Dissert. Inaug., St. Petersburg. Reviewed in Centr. f. Gyn., 1880, p. 350.

39. A. Martin: Zeitschr. f. Geb. und Gyn., 1886, Bd. xxix., p. 329.

40. Westermark: Nordisk Med. Arkiv, Stockholm, 1887, Bd. xix., No. 29.

41. Skene Keith: Edinb. Med. Jour., 1887, p. 811, 883.

42. Gusserow: Arch. f. Gyn., Bd. xxxii., Heft 2.

43. Terrillon: Salpingo-ovarite Traitée par la Laparotomie. Annales de Gyn., May, June, August, 1889.

44. Routier, Terrier, Quénu. Bull. de la Soc. de Chir., Nov. and Dec., 1888.

45. J. L. Championnière: Ovarite, Salpingite, Adhérences, etc. Jour. de Méd. et de Chir. Prat., August, 1889.

CHAPTER IV.

PERIMETRO-SALPINGITIS.

(*Peri-uterine Inflammation, Perimetritis, Parametritis, Pelvic Peritonitis, Phlegmon of the Broad Ligaments, Adeno-lymphitis, Juxta-pubic Adeno-phlegmon, Pelvic Abscess, Pelvic Cellulitis.*)

THE confusion which has long existed in the classification and complete understanding of diffuse inflammations of the pelvis still prevails to a certain extent. Yet, thanks to the better knowledge of tubal inflammations acquired by a more enlightened study of clinical facts, aided by careful observations of conditions revealed by operations, we are beginning to obtain more exact information, which at the same time greatly simplifies the subject. This is our present status: though the starting-point of inflammatory processes is often in the uterus (Bernutz and Goupil), yet it is more frequently from a salpingitis that we get inflammations in the neighborhood of the uterus, the broad ligament, cul-de-sac of Douglas, and pelvic cellular tissue. It is, therefore, essential to include the tube in denominating the disease, and to unite all these lesions under the generic name of perimetro-salpingitis.

The invasion occurs with greatly varying clinical characteristics as to progress and intensity, according to the etiology. This naturally produces a series of distinct clinical types, although pathology includes them under one head.

Historical Sketch.—The more intense inflammations were the first to be observed, and the first described are the severe and rapidly suppurating forms following localized puerperal septicæmia. The works of Grisolle and Bourdon[1] mark this first stage;[2] phlegmon of the broad ligament was still confused with abscess of the iliac fossa of totally different origin.

Nonat, Valleix, and their pupils[3] advanced the clinical knowledge of peri-uterine inflammations by describing the more sharply limited collections of pus which are found posterior to and upon the sides of

the uterus; they considered them to be situated in the cellular tissue which they thought existed not only between the folds of the broad ligament, but around the supra-vaginal portion of the cervix, especially posteriorly, like a ring with its bezel directed toward the cul-de-sac of Douglas, to use a simile of Gallard.

Interminable discussions, more theoretical than practical in their nature, followed the promulgation of these views. At the same moment, almost, another interpretation of the same facts was given by Bernutz and Goupil,[4] in a remarkable description of the clinical phenomena which we now attribute to circumscribed or diffuse inflammation of the tubes, but which they thought due, without exception, to pelvic peritonitis. A few eclectic authorities, as Matthews Duncan and Simpson,[5] admit the two preceding views of the origin of the inflammation; Duncan invented the terms perimetritis and parametritis to distinguish inflammation of the peritoneum from that of the cellular tissue surrounding the uterus. A new interpretation of analogous if not identical series of events came to add to the perplexity of nosologists.

The part played by the lymphatics in peri-uterine inflammations following labor had been dimly apprehended by many authorities. J. L. Championnière,[6] especially, attributed great importance to them, and thought that their influence extended outside the puerperal state, even to an empty uterus. Alphonse Guérin[7] believed that he had discovered a new clinical type, and a different localization of the inflammation around the uterus; he describes it under the name of juxta-pubic adeno-phlegmon. The origin would seem to be in a retro-pubic or obturator lymphatic ganglion and in the afferent vessels below the peritoneum and around the uterus. According to Guérin, whenever phlegmon of the broad ligament spreads into the cellular tissue of the abdominal walls, we have to do with a juxta-pubic adeno-phlegmon. Moreover, Guérin, Championnière, Guéneau de Mussy, Siredey, and Martineau considered that adeno-lymphitis satisfactorily explained the more circumscribed peri- and parametric inflammations.

From that moment the "lymphatic interpretation" carried all before it, and no active part was left to the cellular tissue or to the peritoneum. According to this theory, as in all the preceding ones, the inflammation started from the mucous membrane, and the initial endometritis claimed the full attention of the clinician.[8] At the very outset of these contradictory debates, which divided the gynæcological world, a theory was timidly put forward, but, because of insufficient

demonstration, did not receive the attention it deserved. Aran,[9] who was the first to clearly perceive the extreme importance of the part taken by the ovaries and tubes in uterine pathology, may be said to have anticipated his generation by attributing pelvic peritonitis to inflammation of the uterine appendages. He clearly showed that these are the foci around which gather pus and false membranes. Isolated[10] observations by other writers which demonstrate the truth of this proposition were published, but attracted no attention. At the present time, the tendency is to return to Aran's views, but in my opinion, there is not enough emphasis laid upon this theory as the only possible solution of all peri-uterine inflammations. The more recent writers[11] still give a separate description of parametritis and perimetritis, to which they sometimes add adeno-lymphitis, with the result that the bewildered reader can scarcely follow the subtleties of diagnosis. For my part, I frankly acknowledge that I believe in Aran's theory. The facts which I have personally observed have shown me that nearly all peri- and parametric inflammations are merely forms of salpingitis and perisalpingitis.[12] The lymphatics certainly have an important part to play, but even this is subordinated to the previous inflammation of the uterine mucous membrane and its extension into the oviduct. Now, the primary phenomenon is always the one whose name should be given to the disease.

I will describe in succession the various anatomical forms that may be assumed by inflammation about the uterus and its appendages, beginning with the mildest. These clinical types are: 1. Serous perimetro-salpingitis. 2. Pelvic abscess. 3. Phlegmon of the broad ligament. 4. Diffuse pelvic cellulitis.

Pathological Anatomy.—1. *Serous Perimetro-salpingitis.*—This lesion cannot be seen at autopsies, but may be observed during the course of certain operations. For my own part, I have twice found an œdematous infiltration of the folds of the broad ligament about a tube which was affected with purulent salpingitis. Before laparatomy, by bimanual palpation this infiltration gave the sensation of a rather large tumor, which might have been mistaken for a tumor of the tube itself. Lymphangitis surely has something to do with this acute œdema giving rise to inflammatory nodules. The proof of this fact is seen in the engorgement often produced in the inguinal glands communicating with the lymphatics of the surface of the uterus by a small vessel which accompanies the round ligament (Fig. 2).

These hard œdemas may doubtless invade the loose cellular tissue

surrounding the oviduct, under the influence of an acute attack of salpingitis. Neither is it impossible that an effusion of muco-pus or of blood may from time to time come from the inflamed mucous membrane and irritate the cul-de-sac of Douglas or the frequently prolapsed appendages (L. Tait). Whatever the source, there is no contesting the fact of an intermittent inflammatory œdema around the diseased tubes. Direct observation has demonstrated it, and the law of induction permits us to suppose it present, in those cases where voluminous masses appear and disappear in the course of a few days upon the sides of the uterus—a process witnessed by all clinicians. In

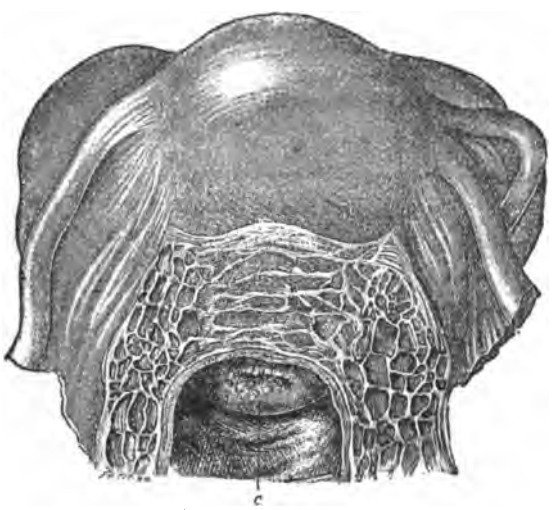

FIG. 15.—SEROUS PERIMETRO-SALPINGITIS (Inflammatory œdema). *c*, Cervix seen through opening in the vaginal wall.

the same way dental caries may cause a large swelling of the cheek which disappears without a trace at the end of forty-eight hours.[13]

To this inflammatory œdema of the subperitoneal connective tissue, which may anatomically be compared to the experimental œdema produced by Ranvier's process, is often added a secretion of serous fluid between the adventitious membranes around the appendages, and especially in the pouch of Douglas, forming serous collections of fluid. Capillary punctures performed as a therapeutic measure have demonstrated their existence and proved their frequency. They have, moreover, been found during some laparatomies. A. Doran [14] has published the report of a curious case where such a collection of fluid was, after opening the abdomen, mistaken for a sarcoma of the ovary,

which they did not dare remove: the rapid disappearance of the tumor left no doubt as to its nature.

This is the first degree of peri-uterine inflammation: in the great majority of cases, it corresponds to a well-defined clinical type, that of ephemeral acute attacks during the course of inflammation of the appendages. To it also may be ascribed the circumscribed and masked parametritis which has been supposed to cause the relaxation or retraction of the uterine ligaments (Schultze).

Suppurative Perimetro-Salpingitis is met with clinically under two very different types. One of them corresponds to the later stages of pelvic peritonitis, as salpingitis and pyo-salpinx correspond to the early stages: that is pelvic abscess. The other, phlegmon of the broad ligaments, is characterized by a special mode of extension of the suppurative process, determined by certain etiological circumstances.

Pelvic Abscess.—This expression must not be misinterpreted as has been the case even recently. Voluminous pyo-salpinx, forming large purulent cavities adhering by a large portion of their surface to the pelvis, have long been taken for encysted collections of pelvic peritonitis or for abscesses beneath the peritoneal folds, and have erroneously been called pelvic abscesses. Their real origin is difficult to demonstrate, as it demands a tearing apart of the tubal sac, which the earlier operators, in search of pus in the abdomen, would not have dared undertake, even had they supposed it feasible. Upon opening the abdomen, if you find a pouch as large or larger than both fists, circumscribed by adhesions upon every side, seeming to be joined posteriorly to the cul-de-sac of Douglas, which it fills, adherent laterally to the pelvis and superiorly to the epiploön or even to the intestine, it is very natural to suppose that an abscess has formed either in the subperitoneal tissue (parametritis), or in the peritoneum, shut in by adventitious membranes (pelvic peritonitis); yet in the majority of cases we have to do with a purulent tubal cyst, free in the beginning and afterward rendered immovable. This may be demonstrated by boldly tearing apart the walls of the cyst (first emptying it by aspiration). When this oftentimes laborious work is finished, we frequently find a cyst with an internal pedicle inserted upon the horn of the uterus, and we recognize it as a dilated tube.

The greater number of so-called pelvic abscesses treated by laparatomy and incision, without any attempt at total extirpation, by Tait, Hegar, Terrillon, etc., a few years ago, were nothing but adherent pyo-salpinx, which should really be entirely removed.[15] Their clinical

and operative history belongs to the chapter on pyo-salpinx, to which I refer the reader. There remain, however, among the number of encysted collections of fluid, a certain proportion of cases where the connection with neighboring parts is so intimate that total removal would be impossible or dangerous. These cases may properly be differentiated by a special name, and may be called pelvic abscess if we clearly specify that this name be reserved for collections of pus which cannot be enucleated. The name has a surgical rather than an anatomical value. In point of fact, at the autopsy it is usually impossible in advanced cases to determine the exact nature of the abscess wall, and to ascertain whether it be peritoneum, false membrane, or dilated tube.[16]

For the same reasons we should include under the head of pelvic abscess certain cysts within the broad ligament, certain forms of hæmatocele which have suppurated and become transformed into a purulent mass; a real abscess, which adheres on every side to the soft or hard portions of the pelvis, and which cannot be removed. Among the cases of pelvic abscess reported cured by laparatomy and incision by Tait[17] was one which he traces to an extra-peritoneal intra-ligamental pregnancy. No vestige of a fœtus was found in the pus, but only the placental débris. The intimate adhesion of a pyo-salpinx to the pelvic walls, or to the pelvic organs, is the first step toward spontaneous rupture. Its tendency is to open into the rectum; a first evacuation relaxes the sac, but it is very soon filled again, and the communication between sac and rectum becomes, if not permanent, at least regularly intermittent. These fistulæ are more rarely produced into the vaginal cul-de-sac. Finally, if the abscess has developed soon after labor, when the appendages which have been carried upward by the gravid uterus tend to fall forward, the suppuration may gravitate into the anterior portion of the pelvis, and, after invading the pre-vesical cavity of Retzius, spread into the groin or toward the umbilicus.[18] These fistulous pelvic abscesses are a most important variety. Long after their first development, they become reduced to passages of no great width, but very sinuous, and surrounded by chronically indurated tissue which it is exceedingly difficult to cure.[19]

Klob[20] has pointed out the frequency of fatty degeneration of the muscular fibres of the uterus, when pelvic suppuration exists. I also have had occasion to observe it; it is especially noticeable when

one attempts to remove an abscess sac which is adherent to the uterus, as the latter then tears easily.

Indurated masses due to the infiltration and proliferation of connective tissue are often found by the side of and extending beyond the abscess. These may continue after it has been evacuated, and form residues very hard to cure. Upon the omentum also may be seen the ligneous masses of chronic epiploitis. All these lesions rapidly disappear after evacuation of the purulent focus.

Phlegmon of the broad ligament is nearly always secondary to a recent labor, when the cellular tissue of this serous membrane has been stretched and relaxed, and the veins, which have become varicose, are the seat of thrombi or may even rupture and let the blood spread more or less extensively around. The result is an anatomical condition eminently favorable to the rapid development of suppuration.

What is the exact starting-point of the process? Does the infection come from the inflamed tubes situated at the upper border of the folds of the ligament? or is it caused by a peri-lymphangitis of the large vessels at its sides? Either process is possible, and the two may indeed coexist; the important fact to bear in mind is the pre-existing anatomical condition which permits the lesion to assume its special character from the start—that of phlegmon, with a tendency to become diffused, which is a different thing from a circumscribed abscess.

There are few exact anatomical documents upon this subject. In the report of an autopsy published by A. H. N. Lewers[21] we find some interesting details. The two folds of peritoneum were separated by an abundant exudation which came from the inferior border of the tube and extended to the base of the ligament below, and to the pelvic walls beyond. The tube was stretched below the convex surface of this swelling. The writer gives no details as to its anatomical condition, which he seems not to have examined; but he calls attention to a small abscess in the substance of the ovary, whose surface adheres to the surface of the broad ligament by recent exudations. The probabilities are that the tube was diseased, and in any case the broad ligament may have been infected by the suppurating ovary. A section of the broad ligament showed spongy areolar tissue the cavities of which were filled with a sero-sanguineous fluid. In an autopsy at which Carter[22] assisted, the section of the broad ligament conveyed the idea of an interstitial injection of plastic material which separated

the normal elements, and kept the veins distended and the lymphatics immobilized and gaping.

The inflammatory infiltration is easily carried beneath the peritoneum, along the psoas iliacus, as far as the anterior superior spine of the ilium, and from there extends into the subcutaneous adipose tissue, through weak points in the musculo-aponeurotic layers, the vascular orifices, and nerve channels. As soon as the purulent sac comes in contact with the abdominal walls, it adheres to them, and gives rise to the sensation of a plaque or resistant flattened mass.[23] Suppuration usually follows infiltration, but it may be absent; the process then stops, and the phlegmon resolves, leaving only indurated masses of cellular tissue. At times I have noticed a curious and little-known phenomenon, which persists for a long while after the peri-uterine inflammatory phenomena have subsided: just as the whole process seems at an end, we discover signs of a suppuration at a greater or less distance from the original site of the abscess, toward the iliac fossa, in the sheath of the psoas or even in the perinephric cellular tissue. It would seem as though some septic residues had been left there and developed slowly after having lost all connection with their point of origin. It is also probable that the lymphatics have a share in the production of these tardy abscesses, which closely resemble those produced in situations where there has been a pre-existing lymphangitis.

In all the preceding affections, septic infection is more or less localized, and the lesions produced remain within clearly defined limits. This is not always the case, however; following certain cases of puerperal infection, the infiltration rapidly extends through the whole pelvic cellular tissue, spreading in the same way as malignant erysipelas; hence the name of erysipelas malignum puerperale given to it by Virchow.[24] The œdematous tissues are livid, the lymphatics full of micrococci, the veins contain blood-clots or pus; these cases usually terminate fatally. The predominant part played by the lymphatics is beyond dispute; this is a veritable septic lymphangitis, starting from the uterine wound and invading everything that surrounds the generative apparatus. It is for this clinical type that I suggest we reserve the name of diffuse pelvic cellulitis.[25]

General Etiology.—I shall not repeat what has already been said about the etiology of tubal inflammations, which applies perfectly to the affections under consideration, since, with the exception of diffuse pelvic cellulitis, which constitutes a class by itself, all, or nearly all,

peri-uterine inflammations are merely an extension from a tubo-ovarian centre. I will only mention the etiological factors peculiar to the various classes which I have named.

Nodules of inflammatory œdema are observed during the course of every variety of acute or chronic inflammation of the tubes.[26]

Pelvic abscesses follow pyo-salpinx, suppuration of an imprisoned ovarian cyst, or pelvic hæmatocele in the vicinity of an inflamed tube. Temporizing treatment or too prolonged or violent explorations favor their development. Is phlegmon of the broad ligament ever observed outside of the puerperal state, which, as I have tried to show, exercises so strong a predisposing influence? Bernutz admits that seventeen out of twenty cases are due to the puerperal state. Frarier,[27] in a work which has become widely known, held that this affection was never due to any other cause. I consider this opinion too exclusive, and that the infection of the uterus by septic operations may bring about the same condition; however that may be, this affection invariably indicates a greater degree of infection and a more rapid process of development than that which produces circumscribed pelvic abscesses.

Finally, diffuse pelvic cellulitis may result from the same conditions—labor or operation upon the genital tract under exceptionally septic conditions. It may be likened to the cellulitis which used to accompany serious operations upon the bladder or rectum.

Symptoms and Diagnosis. 1. *Serous Perimetro-salpingitis.*—In its milder forms the symptoms of an invasion of the parts surrounding the tubes and ovaries by inflammation are those which I pointed out in rather cursory fashion, in the chapter on salpingitis, under the name of acute attacks. Excellent descriptions have been given by several authors, but under various names. Peter,[28] Guéneau de Mussy,[29] mention them without specifying their exact location. Martineau[30] ascribes them to peri-uterine adenitis; Courty[31] also believes in a lymphatic origin. Mundé in America, and A. Martin likewise take this view. Cantin[32] devotes good work to the upholding of this view.

Besides the signs of coexisting salpingitis, the following are some of the symptoms met with: The patients complain of an increase of their usual *malaise;* a marked febrile state is, however, rare; gastric disturbance is slight. By vaginal touch we find increased sensitiveness in the culs-de-sac; touching one particular spot often will cause very sharp and localized pain. There may be general puffiness about the affected region, especially if previous similar or more severe at-

tacks have caused adhesions, which have, so to speak, ankylosed the uterus. In these cases, the signs perceptible to the touch may from an acute exacerbation of the trouble assume an apparently serious nature, of which the experienced clinician alone will understand the real significance; the mildness of the general symptoms will aid in preventing an exaggeratedly gloomy prognosis.

In the course of a few days the puffiness will be seen to disappear, leaving in its place indurated masses not attached to the uterus, which may be once more quite freely movable. There are usually several nodules in the posterior and lateral culs-de-sac, which, as Guéneau de Mussy was the first to point out, feel like rounded ganglia and are more or less sensitive to the touch.[88] These tumors so rapidly change in character that, unless the results of the daily examinations are carefully noted, one might almost fancy the whole thing to have been the work of the imagination (De Sinéty).

Occasionally we may note the long duration of hard, ligneous nodules, which in shape and consistence bear a marked resemblance to fibromata (Guéneau de Mussy). They may be distinguished from the latter by the lack of intimate connection to the uterus, and by the absence of dilatation of the uterine cavity. A prolapsed ovary is larger, and forms an isolated tumor which gives rise to peculiar nauseating pain and faintness. The tumor of small ovarian cysts or a cyst of the broad ligament is entirely different; it possesses elasticity or fluctuation, is absolutely lateral, single, and perceptible by bimanual palpation only, not by vaginal touch. Scybala can cause an error of diagnosis only to careless examiners and those who omit the rectal exploration. The use of the speculum is of no value. The course and progress of these œdematous nodules and collections of serous fluid of peri-salpingitis are uncertain and intermittent; they constitute one of the elements of the recurring inflammations of the appendages described in the chapter on salpingitis; they show a tendency to return, but none to suppurate.

2. *Pelvic Abscess.*—This name does not imply merely a collection of pus situated in the pelvis, otherwise pyo-salpinx would have to be included under this head. The surgical characteristic of pelvic abscess is this, that it is a collection of pus which is not free, not capable of being enucleated or tied off and removed, but a true pelveo-parietal collection adhering to the pelvis, which forms its walls. It has been described under the names of pelvic peritonitis and suppurating parametritis, even phlegmon of the broad ligament,

which is an entirely distinct clinical variety, has been called pelvic abscess.

Clinically, a pelvic abscess is usually the last phase in the development of pyo-salpinx, and there is no symptomatic boundary line between them. Yet occasionally acute phenomena may mark the transition from circumscribed suppuration of the tubes and ovaries (pyo-salpinx, ovarian abscess) to the diffused form. If the pus break into the peritoneal cavity, or if there be simply an acute peripheric inflammation, we may have the sudden appearance of sharp pain causing faintness, and accompanied with phenomena analogous to those of peritonitis—chills, vomiting, distention of the abdomen, drawn and anxious facial expression, and thready pulse. At the same time the fever (which may until then have been absent, or discovered only by the most careful thermometric examination) appears, and assumes a remittent form with evening exacerbations. There are functional disorders of neighboring organs—constipation, dysuria, rectal and vesical tenesmus. If the abscess project toward the rectum, there may be complete retention of fæces.

(A peculiar but quite frequent epiphenomenon of pelvic suppuration is the production of diaphragmatic pleurisy. Potain[34] noted the fact that simple inflammations or ovarian or peri-ovarian irritations might act by a sort of nervous reflex upon the pleura. A. Lasne[35] took up this subject, and considers the pleurisy to be due to a propagation of the inflammation from the pelvic peritoneum to the diaphragmatic peritoneum by means of the lymphatics, more especially those which accompany the tubo-ovarian vessels and go to the pillars of the diaphragm. This pleurisy is usually dry and not severe.)

Touch and bimanual palpation should be used with the greatest care. By these we ascertain that the uterus is immovably fixed in the pelvis by plastic matter, which is merely the œdema produced by intense inflammation, and which has infiltrated all the adjacent cellular tissue. After a few days, this œdema diminishes, and as it were unmasks the projecting abscess, which is separated from the cervix by a groove. This tumor is smooth, regular, and difficult to define at its upper limit: it imparts a sensation of heat to the finger, and arterial pulsation due to the dilatation of the vessels may often be felt. Fluctuation is rarely appreciable, because of the indurated cervix, which is often as hard as pasteboard; and because of the great thickness of the infiltrated tissues intervening between the examining finger and the purulent mass, which is often quite small, although

surrounded by an inflammatory exudate (*gangue*). An important characteristic is the immobility of the uterus and the tumor, which are firmly united together. By means of bimanual palpation we also note that the tumor is adherent to the pelvic walls. The uterus is displaced, with the cervix flattened against the pubis if, as is most frequently the case, the tumor is situated in the posterior cul-de-sac. The mass may also project at the sides, and more rarely it is situated between the uterus and bladder.

Rectal touch is of value in furnishing additional information as to the connections formed by the tumor; the speculum is useless.

The formation of protective adhesions which serve to limit the extension of the abscess may cause a prolonged remission of the symptoms. But when there is an attempt at evacuation, the lancinating pains and the fever become intensified. If the pus point toward the posterior cul-de-sac, the vagina becomes indurated; if toward the rectum, there is a sensation of weight on the perineum, and an exceedingly painful rectal tenesmus.

Severe crises often precede the opening of the abscess into the rectum, vagina, or (which is rare) the prevesical cellular tissue, and are followed by short periods of calm. The abscess, as a rule, is not completely emptied, and symptoms of chronic absorption appear; or else the abscess may be completely emptied, but quickly refilled, and continue to discharge its contents at irregular intervals with the same accompaniment of general symptoms. The patient falls into an enfeebled and hectic condition similar to that described in relation to fistulous pyo-salpinx. At this stage the two affections are not to be clinically distinguished; and the difference between them due to the fact that the abscess may in one case be enucleated, and in the other not, concerns operative medicine alone. Exceptionally the patient is cured after evacuation of the pus, but the abscess usually leaves fistulæ of interminable duration. There have been a few cases of sudden death due to the rupture of the abscess into the peritoneum; their rarity is due to the formation of false membranes which circumscribe the focus of suppuration.

Pelvic abscess may be tuberculous, as may be the pyo-salpinx which causes it; in such cases we shall usually find signs of the disease in the pulmonary tract.

The diagnosis of pelvic abscess and of pyo-salpinx is easily made when there is any mobility of the cystic and pediculated tubal mass, but if this cystic tumor is closely adherent, or has developed fistulæ,

the diagnosis becomes impossible; a study of the general symptoms and commemorative signs will lead us to suspect that the inflammation is becoming diffused, and laparatomy alone can completely decide the matter. Phlegmon of the broad ligament forms a tumor laterally placed on the uterus; it appears shortly after labor. Pelvic hæmatocele from the outset shows fluctuation; it gives rise to febrile symptoms only if it suppurate and become transformed into a pelvic abscess.

3. *Phlegmon of the Broad Ligament.*—Foreign writers usually describe this under the head of parametritis; it seems to me highly desirable to preserve the old name under which in France it was the subject of descriptions which have become classical, the more so that this name clearly indicates the principal if not the initial seat of the lesions.

It usually makes its appearance toward the end of the first week after a labor rendered septic by special conditions (epidemics, lack of sufficient antiseptic precautions, etc.). A severe chill may mark the onset. In some cases local pain is the initial symptom; it is situated in the lumbar region and extends into the thighs. Anorexia and sleeplessness, profuse sweating, slight erratic chills, fever of a remittent type, a profound alteration of the facies usher in the process of suppuration. When the pus is fairly collected in a mass, there may be a delusory period of relative calm. By vaginal touch, we find in the early stages only a general puffiness of the culs-de-sac, which renders the uterus immovable, and which usually projects upon one side of it. A later examination with bimanual palpation shows that there is a localized unilateral mass joined to the uterus and uniting it to the pelvic wall, and reaching to the superior strait, as if the broad ligament were solid. A crescentic prolongation of this mass usually surrounds the cervix, from which it is separated by a groove. There is a marked lateral version of the uterus toward the unaffected side.

It is not impossible that resolution may occur, and the disease terminate by a resorption of the plastic products and inodular retraction of the broad ligament. This, however, is very exceptional. Usually, after a short remission, the chills reappear, with profuse perspiration and diarrhœa, the general condition clearly indicating septic infection. Death may supervene at this stage, but, as a rule, the pus succeeds in finding a channel for evacuation, unless the surgeon have anticipated the efforts of nature. The purulent infiltration invades the whole of the broad ligament, and finally goes beyond its limits,

toward the vagina and the sides of the pelvis; the vaginal cul-de-sac becomes thickened and indurated, and gives to the examining finger the sensation of what has been called pasteboard vagina. Within the anterior superior spine of the ilium, or a little below it, just above Scarpa's triangle, from which it is separated by the crural arch, there appears an indurated plastron, which indicates the invasion of the subcutaneous cellular tissue. When this occurs, the tumor may have gone beyond the boundaries of the pelvis into the iliac fossæ. The plaque-like surface spreads, becomes softened at the centre, and reddens, while the greenish and viscid pus is often poured forth in enormous quantity from a small aperture. The opening may be into the vagina, or, more rarely, into the rectum, the cæcum, or even the bladder. Fatal peritonitis is due rather to an extension of the inflammation than to the opening into the serous cavity. The aperture may remain fistulous, smaller and smaller quantities of pus issuing therefrom, and may finally close after a protracted period. The patient may die of hectic, unless surgical interference open the abdomen, drain and disinfect the suppurating region.

The diagnosis offers difficulties only at the outset, when it is a matter of doubt whether the pus will remain circumscribed and form a pelvic abscess, and at the termination of the process, when, the suppuration having extended beyond the pelvis, phlegmon of the broad ligament has been transformed into an abscess of the iliac fossa. A decisive opinion can be reached only by a study of the course of the disease, which is very characteristic and not in the least like that of perityphlitis, ossifluent abscess, or rapidly formed cancer of the ilium.

4. *Diffuse pelvic cellulitis* is merely the local manifestation of a general condition of septicæmia, which of itself so attracts the attention of the physician that I have no need to dwell upon it. I would simply call attention to the rapidity of its extension, which has been compared to that of erysipelas; to the tendency to mortification of the celluar tissue, which may give rise to emphysema; to the ulceration of blood-vessels, often causing formidable hemorrhages;[36] and to the frequency of a fatal issue.

Prognosis.—This varies according to the variety and the degree of the perimetro-salpingitic inflammation. A lack of careful observance of these distinctions will account for the differing opinions entertained by various authorities upon this matter of prognosis.

The prognosis in regard to serous perimetro-salpingitis is that of

the tubal lesion which occasions it. Its course is apt to be one of recurring attacks, but it does not endanger life; it is a prolonged infirmity rather than a disease.

Pelvic abscess is more serious; it may cause death from acute peritonitis, from rapid septicæmia, or from slow consumption. The course is uncertain and marked by exacerbations, as Gosselin pointed out.[37] But this surgeon, together with his contemporaries, evidently included, under the name of peri-uterine phlegmon, catarrhal salpingitis, with inflammatory œdema and pyo-salpinx. Though the patient may escape acute accidents, and the disease, from resorption or spontaneous evacuation of the focus of inflammation, may be said to be cured, yet the future health of the patient will be constantly impaired because of the chronic lesions of the tube and also because of abnormal adhesions, retractions of ligaments, and displacements of the uterus and ovaries. Sänger has noticed that the ureters can be much more easily felt in patients who have had peri-uterine inflammations, as if their walls were thickened by the inflammatory processes in their vicinity. Some cases have even been reported of accidents due to pyelo-nephritis caused by retraction of cicatricial tissue resulting from pelvic abscess.[38] Freund[39] describes under the name of chronic atrophic parametritis a disease which might frequently be due to a pelvic abscess cured by spontaneous absorption with resultant sclerosis of the inflamed tissues. By this retraction the vessels are compressed, and as a result there is atrophy of the whole genital canal, with a premature menopause. Phlegmon of the broad ligaments is very serious. Death may take place during the inflammatory stage at the outset, or supervene upon prolonged suppuration, or occur suddenly from an embolus caused by thrombosis of the pelvic veins. Diffuse pelvic cellulitis is nearly always fatal.

Treatment.—Perimetro-salpingitis should be treated in the same way as the salpingitis which has given rise to it. The essential features are rest, revulsives, and prolonged injections of hot water. The cases which have been so rapidly cured by electricity surely[40] belong to this category. Acute attacks have often been known to disappear rapidly after energetic intra-uterine treatment, curetting, and injections, and this result has been adduced in proof of the lymphatic origin of perimetritic affections.[41]

These acute attacks are not the least of the indications which have led surgeons to remove the appendages,[42] thus curing the salpingitis and the peri-salpingitis at the same time.

The tumors formed by acute inflammatory œdema show no tendency to suppuration; and as these are the tumors which occur most frequently, they have brought about a habit of expectant treatment which has been too widely applied.

I entirely disapprove of punctures for the evacuation of collections of serous fluid; they may cause suppuration and do not hasten resolution.

In pelvic abscess and abscess of the broad ligament the principal indication is to moderate the intensity of the inflammation by prolonged hot douches, by local bleeding, etc. Then, as soon as the pus is formed, we must go in search of it, for, according to Brickell,[43] "no surgeon should tolerate the presence of pus in any part of the body." Systematic abstention, recommended by Becquerel, Aran, West, De Sinéty, Siredey, and Danlos,[44] etc., is rapidly losing ground.

In what locality shall the collection of pus be opened, and how shall it be done? I will successively consider the different cases which may cause a variation in the surgical procedures.

A. Abscess Pointing toward the Vagina.—Is puncture with a trocar all-sufficient? Simpson has recommended it, and recently Tenneson[45] has taken it up, penetrating into the posterior cul-de-sac, even in the absence of fluctuation. He uses capillary puncture with aspiration for the evacuation of the serum or the pus of perimetritis. This procedure is not to be recommended; there is danger of wounding the intestines should the abscess sac be far from the vaginal wall; it is inadequate if the sac be adherent; its only use in the latter case is to confirm the diagnosis and to serve as a preliminary measure to immediate and more efficacious treatment.

Professor Laroyenne,[46] of Lyons, also practises puncture through the vagina into the masses of inflammatory products of chronic peri-uterine disease, with latent effusions of serous or bloody pus. His especial trocar, which is of quite large calibre (sound No. 20), has a groove upon the side, making it answer the purpose of a grooved director and permitting the introduction of a lithotome after the puncture, to make a lateral incision of from one and one-half to two and one-half inches (Fig. 16). A glass tube with a bulb at one end is introduced, and through it we can apply antiseptic irrigations under slight pressure. Laroyenne has obtained good results from this method. I believe that the technique of the operation can be simplified by following the aspiratory puncture, which has revealed the presence of pus, by incision of the successive layers of the vaginal

cul-de-sac, arresting hemorrhage by hæmostatic sutures such as Martin introduced in the early days of vaginal hysterectomy. Tamponade would also control hemorrhage for the time being. When the abscess is opened, a cross-shaped rubber drainage tube may be inserted, and iodoform gauze packed around it. This is in substance Mundé's[47] method. He supplements it by a careful cleansing of the abscess cavity with a blunt curette, which seems to me to be of use in a few exceptional cases only. A dermoid cyst containing hair and other débris was the nucleus of one of the abscesses opened by Mundé. Curetting is not free from danger. Laroyenne[48] has demonstrated that the superior wall of a pelvic abscess is usually very friable and may be lacerated by mere forcible injections.

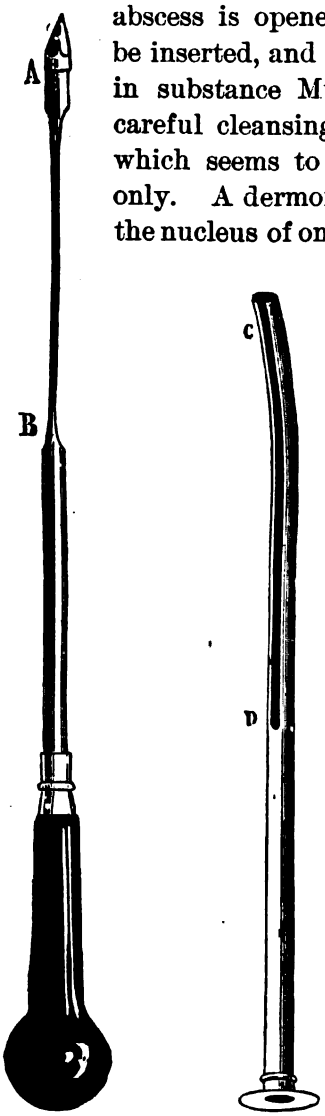

FIG. 16.—LAROYENNE'S TROCAR AND CANULA.

To avoid wounding the ureters and the uterine and vaginal arteries,[49] we should observe the following rules in the choice of a locality for the incision:

Tumor posteriorly placed: transverse or vertical incision directed in accordance with the axis of the tumor.

Tumor laterally situated: an oblique incision, directed posteriorly and outward; in front it must not go beyond the prolongation of the transverse diameter of the cervix.

Tumor in front: small transverse incision, combined with a longer antero-posterior incision.

It is my opinion that incision through the vagina should be reserved for a small number of particularly favorable cases, and that as a general mode of procedure it is far inferior to laparatomy. Direct exploration alone, after opening the abdomen, will show whether the sac can be removed; this is curative treatment, whereas simple incision does nothing to prevent constant recurrence of the trouble. Moreover, in making an opening through the vagina, we can never be sure of not wounding loops of intestine agglutinated in Douglas' cul-de-sac.

B. Abscess Pointing toward the Rectum.—Does the fact of its pointing in this direction oblige us to make an incision in a region so unfavorable to the future antiseptic condition of the abscess cavity? I think not, and in this opinion am opposed to Byford,[50] who unqualifiedly praises this procedure.

The pus can be much better evacuated by means of an incision in the para-sacral region or by perineotomy.

C. Abscess Situated at an Equal Distance from the Vagina and the Abdominal Walls.—Various ways of reaching it have been suggested—

1. The perineal method (Hegar, Sänger, O. Zuckerkandl).

2. The pelvic or sacral method (E. Zuckerkandl, Wiedow, Sänger).

3. Making an incision above Poupart's ligament and loosening the peritoneum to the abscess (Hegar[51]) by means of an operation similar to the one used for tying the iliac artery, and which I propose to call subperitoneal laparatomy.

4. Laparatomy properly so called, or transperitoneal laparatomy, recommended especially by L. Tait.[52] This really means two processes, according to whether we suture the abscess walls to the abdomen or resect them, reducing the cavity to the smallest possible dimensions and draining through the vagina (Martin).

5. Incision at two different times.

I will rapidly consider these various methods.

1. *Through the Perineum.*—Hegar[53] long ago proposed to evacuate pelvic abscesses through the ischio-rectal fossa, by carrying an incision from the tuberosity of the ischium to the tip of the coccyx.

Vertical perineotomy recommended by Sänger[54] is simply an enlargement of Hegar's perineal method; the incision is made to one side of the median line, begins at the level of the posterior third of the labia majora, and ends an inch from the anus, between that orifice and the tuberosity of the ischium; by this means we may penetrate above the levator ani (Fig. 17).

Otto Zuckerkandl's transverse perineotomy, dividing the recto-vaginal partition, has been especially recommended for the removal of uterine cancer (Vol. I., page 378), and Sänger has pointed out that it may also be useful for the evacuation of pus in the cul-de-sac of Douglas. The incision is carried from one ischium to the other and at each end may be slightly prolonged from before backward, and from within outward, giving it the form of a trapezium without a base. The cul-de-sac may be deeply incised, and the pus evacuated with less

chance of infection than if done through a rectal opening. But the wound, being funnel-shaped, will not allow of the manipulations necessary for the removal of a pyo-salpinx (Fig. 18).

2. *Pelvic or Sacral Method.*[55]—Quite recently several plans for reaching the abscess have been proposed.

E. Zuckerkandl's and Wölfler's para-sacral incision, carried deeply

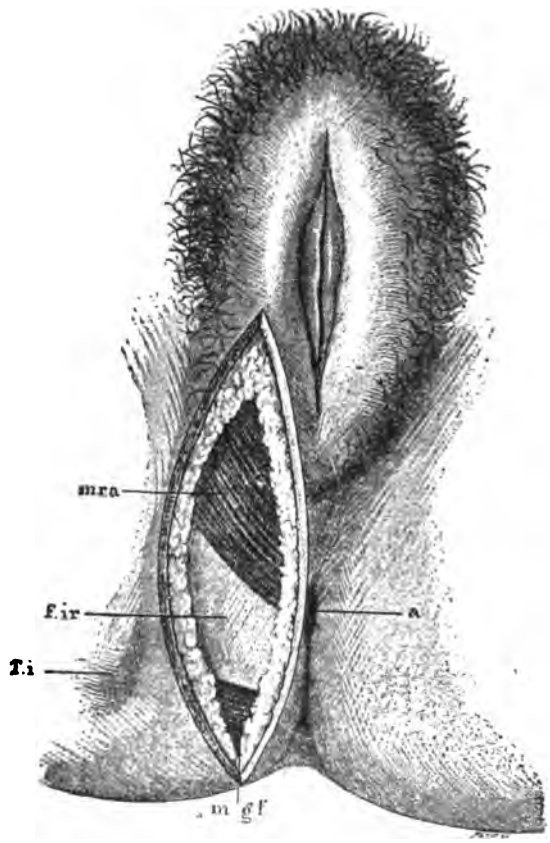

FIG. 17.—VERTICAL PERINEOTOMY (HEGAR, SAENGER). *a*, Anus; *Ti*, tuber ischii; *mgf*, gluteus maximus; *mra*, levator ani; *Fir*, ischio-rectal fossa.

along the side of the sacrum, penetrates into the superior pelvi-rectal space, above the levator ani. Temporary or permanent resection of the coccyx and sacrum is a method adopted by Kraske, and modified by Hegar (Vol. I., page 380). This operation is of use only when we need a large field, as in the removal of a tumor; it is not needed for the purpose of evacuation.

These various processes all show ingenuity, and may be of real service in special cases, but they are inferior to laparatomy, in that

the latter alone permits of an incision large enough and so situated as to enable us to ascertain where there is a removable pyo-salpinx or a pelvic abscess, which only an incision can relieve. By adopting the former means, there is always the risk of simply cutting into sacs which might be more rapidly and completely cured by removal.

FIG. 18.—TRANSVERSE PERINEOTOMY (O. ZUCKERKANDL). *A*, Anus; *R*, rectum; *V*, vagina; *Mra*, levator ani muscle; *Fir*, ischio-rectal fossa.

3. *Subperitoneal laparatomy*[56] possesses the decided advantage of avoiding the dangers consequent upon an effusion of pus into the serous cavity; it is, for this reason, more advantageous than laparatomy properly so called, or transperitoneal laparatomy. But it has this drawback, that if the sac is enucleable, even though adherent, it cannot be removed, but merely incised. I am less in favor of this operation since our knowledge of pyo-salpinx has become more

definite; yet as it may in some cases be very useful, I will give a rapid description of it.

We must, in the first place, by touch and bimanual palpation, ascertain the exact situation of the abscess. Then about half an inch above the crural arch we make an incision of four to five inches in length, cutting through the successive layers of tissues until we reach the subperitoneal cellular tissue. The serous membrane, as in ligation of the external iliac, is separated by the fingers toward the horizontal ramus of the pubis. The peritoneum is now pressed up from within, either by a large retractor or the fingers of an assistant, while the operator carries his index finger into the wound and endeavors to find the resistant abscess. He may little by little reach the base of the broad ligament, in the deepest portion of the pelvic cavity. When the purulent mass is recognized by the fluctuating sensation which it imparts, it is opened, and the cavity carefully cleansed, and then drained, either through the abdominal wall, or by a cruciform tube which can readily be introduced through the posterior cul-de-sac by the aid of Wölfler's forceps (Fig. 52, Vol. I.). For the success of the latter manœuvre, we must ascertain, both by vaginal touch and an examination of the bottom of the wound, that only a short distance separates the two cavities. I have used this method several times with resulting cures.[57] The separation of the peritoneum may at times not suffice to give us free access to the abscess, either because its situation has been erroneously diagnosed, or because previous inflammation has caused adhesions of the serous membranes and it is so friable that there is danger of laceration. In such cases we may at once apply the first part of Hegar's ingenious process of incisions at two different times, which I shall describe later on.

4. *Incision by laparatomy* properly so called, or transperitoneal section, was first practised by Lawson Tait, whose example was then followed by many other surgeons.[58] The abdominal opening is rather small (from three and one-half to five inches); the fingers are introduced for the purpose of finding the abscess, which is evacuated by aspiratory puncture; the abscess sac is then drawn up to the edge of the abdominal wound and opened, and its walls stitched to the lips of the wound; it is then thoroughly cleansed, and filled with antiseptic gauze, or else two large drainage tubes are inserted. There have been many brilliant results from this operation, and some failures. Several difficulties may be met with; the sac may be so closely adherent to the pelvis, or so small, that we cannot draw it up to the

edges of the abdominal wound;[59] or else if we succeed in fixing it in position it subsequently tears apart and there is an effusion of septic matter into the peritoneum. Emmet states that he has seen Lawson Tait himself abandon the operation because he could not separate the sac from the loops of intestine which adhered to and covered it.

When the walls of the abscess are well defined (which is rare), but its enucleation is impossible, we should proceed in the following manner: The sac is to be evacuated by puncture, opened with the greatest care so as not to injure the peritoneum, and cleansed; its base and the posterior vaginal cul-de-sac are to be explored, in order to ascertain whether drainage be possible in that direction. If it be found practicable, a large trocar or Wölfler's forceps should be pushed through the vaginal cul-de-sac, introducing a rubber cross drainage tube the arms of which are to be inserted in the bottom of the abscess cavity. We now resect as much as possible of the purulent pouch, and close it on the abdominal side by a continuous suture with a few additional supporting catgut stitches. A careful "toilet" of the peritoneum follows, and the abdominal wound is sewed up (Martin).

If the abscess walls are not clearly enough defined to allow of the preceding measures, we shall have to be satisfied with a thorough cleansing of the cavity, subsequently filling it with iodoform gauze according to the method of antiseptic tamponade of the peritoneum[60] described on page 75, Vol. I.

5. Finally, Hegar[61] has proposed an opening at two different times, as Volkmann did in the case of hydatid cyst of the liver. At the first *séance* we perform a laparatomy, and tampon with iodoform gauze, so as to make a channel from the abscess cavity to the abdominal incision. At the second *séance*, four or five days later, when the adhesions are strong enough, we incise the abscess sac. These proceedings may be performed through the posterior vaginal cul-de-sac.

C. Abscess Close to the Abdominal Wall.—In this case we find the pus by making an incision just above Poupart's ligament, and if necessary we loosen the peritoneum for a limited distance. A slight wound of this membrane is not dangerous if the abscess sac be large and superficially placed, for the intra-abdominal pressure will push the sac between the lips of the incision and keep it there in such a manner that the pus cannot find its way into the peritoneal cavity. We must not confuse subperitoneal laparatomy with the incision of a collection of pus in the iliac fossa, accompanied by the separation of a very small portion of the serous membrane, but without any deep

penetration into the pelvic cavity. Some writers have committed this error.[62]

In the case of a larger collection of pus, as in phlegmon of the broad ligament, the incision should be from three to four inches long, and should be kept open by the insertion of two large drainage tubes joined together like gun barrels, which are to be gently pushed to the bottom of the sac. We may use in their stead a strip of iodoform gauze. If irrigation be used, the solutions should be weak (carbolic, 10 parts to 1,000; bichloride, 1 in 5,000), and the last injection used should be merely of filtered and boiled water, so as to avoid all danger of absorption of a poisonous fluid. If in spite of these precautions we observe symptoms of sepsis, then we may fill the diverticula of the sac with iodoform gauze. Finally, if the abscess extend inferiorly almost to the posterior vaginal cul-de-sac, and is recognized by vaginal touch, we may drain in this direction. But we must take great care not to wound the bladder, by guiding the point of Wölfler's forceps or Chassaignac's larger trocar along the finger to the posterior vaginal cul-de-sac, from above downward, while a finger of the other hand is inserted in the vagina. Mundé[63] has twice had occasion to deplore this accident, which, however, had no serious results.

The residues of old peri-salpingitic inflammations, false membranes, adhesions, etc., give rise to complex and painful phenomena, by the pressure which they exert upon the ovaries and tubes, by the displacements of the uterus which they cause, the agglutination of loops of intestine, the adhesion of the omentum to the pubis, compression of the ureters, etc. It is particularly in these cases that massage is of benefit, as it assists in the absorption of the plastic products. When the pain is a prominent symptom and neuralgic in character, the faradic current may give relief.[64]

As I mentioned above in reference to the treatment of salpingitis, it has been suggested that laparatomy should be performed solely for the purpose of setting the compressed or displaced organs at liberty, by destroying the adhesions, without removing the uterine appendages. The good results obtained by this procedure, while they do not prove the absolute efficiency of these incomplete operations, which far too often have served as an excuse for errors of diagnosis, at least show how large a share should be attributed to this pathological element in an interpretation of the morbid symptoms.[65] Another remote result of inflammations around the uterine appendages is the modification in the resisting power of the ligaments, the broad, round,

and utero-sacral. Our knowledge upon this subject is exceedingly limited, and the deductions drawn from the supposed lesions are mainly theoretic. Yet it is certain that uterine dislpacements are often due to ligamental relaxation or contraction, the result of previous inflammatory conditions. I would especially call attention to the contraction of the broad ligament so frequently observed in cases of extensive laceration of the cervix on the same side, producing a certain amount of lateral displacement of the uterus from chronic parametritis. It may perhaps be merely a chronic perilymphitis, sclerosis of the connective tissue of the broad ligament around the numerous lymphatic vessels at the base of the ligament, which go from the cervix to the iliac ganglia (Fig. 2). Here again, massage may be of use. I will speak in this connection of a lesion described by Freund[66] under the name of chronic atrophic parametritis, although it would seem to be straining a point to include it under the head of parametritis. In some young women the sexual organs are found to be as shrivelled as if the menopause had long since been reached; the broad ligaments are contracted and indurated. It would seem as though the uterine atrophy had extended to the neighboring parts. Freund recommends hot douches and massage as treatment.

I append a few technical details of *massage of the internal genital organs,* which I have borrowed from a monograph of Vulliet.[67] External massage of the abdominal walls is a mere preparatory measure to render the parts supple. Mixed massage or abdominal-vaginal massage is the kind most used. However rigid may be the abdominal and vaginal walls, there is always one place when the two hands may meet; it is in the suprapubic region, just behind the symphysis. The heel of the external hand rests upon the mons Veneris, the fingers toward the umbilicus. The index and middle finger of the other hand enter the vagina together if it be large enough, otherwise one after the other; their dorsal surface is now turned to the perineum, with the palmar surface against the vesico-vaginal wall. The anterior commissure is thus out of reach and not affected by the manœuvres. The movements (friction, pressure, kneading) are to be slow and well sustained. The abdominal hand pushes upon the tissues from above downward, the vaginal hand from below upward. The mistake most frequently made is that of pushing too hard from above and too little from below. Each hand must do its share of the work. Just above the symphysis the hands are separated from each

other only by the abdominal walls, which they push upon, and by the bladder; but a trifle farther back the uterus, if in normal position, will be interposed between them. A condition of anteversion is the most favorable to massage, and the uterus must be brought into this position. In chronic endometritis, and in all uterine affections except neoplasms, which have produced hypertrophy of the organ, the following method is observed: When the uterus is well to the front, the fingers in the vagina keep it immovable in this position, while the external hand practises a series of frictions upon its posterior surface, and then endeavors to seize the fundus and press it concentrically as is done in the obstetrical manœuvre of expression.

If there be an infiltration of the cellular tissue around the cervix, the external hand will keep the uterus down, while the fingers of the other hand gently and slowly exercise frictions around the cervix. To *masser* the sides of the uterus, both hands unite upon the side of the organ and push it to one side; this brings the lateral region more to the centre and renders it more accessible. Bands of adhesion are usually found in the antero-lateral region of the uterus, uniting one side of the uterus to the pelvic peritoneum of the same side; these are stretched by the sideways pushing of the uterus. By means of these movements we can determine their point of attachment. The massage consists in kneading the regions where the adhesions exist, to cause their absorption, and in moving the uterus to free it from the constricting bands.

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1. Grisolle: Archives Générales de Médecine, 1859. Bourdon; Revue Médicale, 1841.

2. A mere mention of previous theories will suffice; Moriceau thought all post-puerperal tumors due to retention of the lochia; Puzos believed in a metastasis of the milk, and his opinion which was upheld up to the beginning of this century by Ritgen, A. E. Siebold, Busch, etc., has left very marked traces in the popular fallacies upon the subject.

3. Nonat: Gazette des Hôpit., 1850, pp. 97, 110, 129. Eleuthère Martin: Thèse de Paris, 1851. Valleix: De l'Infl. du Tissue Cell. Péri-utérin. Union Méd., 1853. Gallard: De l'Infl. du Tissu Cell. qui Entoure la Matrice. Thèse de Paris, 1855.

4. Bernutz: Archiv Gén. de Médecine, 1857. Bernutz and Goupil: Clinique Médicale sur les Maladies des Femmes, vol. ii., 1st Memoir, Paris, 1862.

5. M. Duncan: A Practical Treatise on Perimetritis and Parametritis, Edinburgh, 1869. J. Y. Simpson: On Pelvic Cellulitis and Pelvic Peritonitis, Clinical Lectures on the Diseases of Women, edited by A. R. Simpson, Edinburgh, 1872.

6. J. L. Championnière: Thèse de Paris, 1870.

7. Alph. Guérin: Leçons Cliniques sur les Mal. des Org. Gén. Internes de la Femme. Onzième Leçon, Paris, 1878. In a communication to the Academy of

Medicine (Bullétin de l'Académie, May 11th, 1887, p. 533) Alph. Guérin denies the existence of phlegmon of the broad ligament, which he considers to be an unrecognized juxta-pubic adeno-phlegmon. He bases his statement upon anatomical facts. According to his theory, the broad ligament is formed of two aponeuroses placed endwise, and a third lying flat at their base; this arrangement forming a closed cavity from which the pus cannot escape into the neighboring cellular tissue. As pus has been observed in this situation, however, the eminent academician considers the previously held ideas of its localization to be incorrect. He thinks that adeno-phlegmon is the result of lymphangitis of the network of lymphatics around the cervix going to the ganglion placed near the subpubic opening. This would constitute a veritable bubo, and the intimate connections between the cellular tissue surrounding it, and that lining the abdominal walls, perfectly account for the inflammatory plastron. Unfortunately this seductive theory is not above criticism as to the anatomical considerations upon which it is based. The novel conception of the broad ligament as a closed cavity which the peritoneum covers "as it would envelop the stomach or intestines," stands in need of demonstration; the dried specimens prepared by Jarjavay which have been presented as proof, cannot be accepted as sufficiently demonstrative, for in the preparation of such specimens the natural arrangement is often unconsciously displaced. As to the subpubic ganglion (mentioned by Cruveilhier) it does not receive the lymphatics from the cervix. Sappey (Bull. Acad. de Méd., May 18th, 1887) asserts, on the contrary, that the uterine lymphatic vessels take the following course: from the muscular tissue they go to the ganglia at the angle of bifurcation of the common iliac; those from the superior border to the lumbar ganglia. According to Sappey, the lymphatics of the mucous membrane sometimes go to a little ganglion which is not constant, but which, when present, is situated near the insertion of the cervix into the vagina. This great anatomist did not hesitate to state that a dried specimen in the museum at Clamart to which A. Guérin referred in support of his theory, was artificially constructed and valueless. If suppuration of the broad ligament exist, is it due to lymphangitis? Guéneau de Mussy was the first to advance this theory; L. Championnière supported it, and even claimed that the broad ligament contains lymphatic ganglia, which is incorrect. This same authority describes surrounding utero-ovarian vessels which neither Auger nor Poirier have been able to find. (Auger: De la Lymphadénite Péri-uterine. Thèse de Paris, 1876. Fiouppe: Lymphatiques Utérins, etc. Thèse de Paris, 1876.) It is, however, indisputable that large lymphatic vessels run along their sides and may serve as a path for the inflammatory process. Poirier has recently given a good description of them in the thesis of Cantin: Des Lymphangites Péri-utérines Non-puerperales. Thèse de Paris, 1889. Poirier: Progrès Medical, 1889, Nos. 47 to 51, 1890, Nos. 2 and 4.

8. A propos of these discussions, we should mention the names of Gosselin, Doherty, Churchill, Lever, Bennett, Kiwisch, Scanzoni, and more recently Olshausen, Spiegelberg, W. A. Freund, Monprofit, Routier, Poirier, etc. I am, however, giving a mere outline of the evolution of the various theories, and not a complete history.

9. Aran: Leçons Cliniques, p. 667.

10. Darolles: Annales de Gynéc., vol. iv., p. 427. Bouveret: Ibidem, vol. vi., p. 419.

11. A. Martin: Traité Clinique des Maladies des Femmes, French trans., Paris, 1889.

12. Consult on this subject, J. W. Taylor: Clinical Lecture on Pyo-salpinx with Remarks on the Old Faith and the New, Regarding Parametritis. Lancet, 1889, vol. ii., p. 581.

13. De Sinéty: Traité Pratique de Gyn., 2d edit., Paris, 1884, p. 817. Des Inflammations qui se Developpent au Voisinage de l'Utérus Considérées surtout dans leur Forme Bénigne. Progrès Médicale, 1882.

14. Alban Doran: Anterior Serous Perimetritis Simulating Ovarian Sarcoma when Explored by Abdominal Section. Recovery with Disappearance of the Cyst. Trans. of the Obst. Soc., London, January 5th, 1889.

15. This is particularly the case with a series of observations published by Terrillon: Ouverture des Abscès Intra-péritonéaux et Profonds du Bassin par la Laparotomie. Bull. de la Soc. de Chir., June 1st, 1887, p. 367.

16. There are many examples of the difficulty attending the right understanding of pathological preparations. Alph. Guérin (Leçons Cliniques sur les Mal. des Org. Génit. Internes de la Femme, Paris, 1878, p. 858) states that he had occasion to assist at the autopsy of a woman who died in the service of Nonat, of a disease called by this physician peri-uterine phlegmon, but which he demonstrated to be pelvic peritonitis. This proves to his mind that "pelvic peritonitis is the disease which Nonat considers to be an inflammation of the peri-uterine cellular tissue." But A. Guérin says nothing in this connection about the condition of the ovaries and tubes. Goudot and Moulonget (Bull. de la Soc. Anatomique, April 27th, 1887) have shown a specimen which well illustrates the subject under discussion. The patient who was not in the puerperal state suffered from pyo-salpinx which gave rise to all the classical symptoms of pelvic peritonitis as described by Bernutz. At the autopsy, the pelvis was found to be filled by a voluminous mass which eached to the umbilicus, and was covered by the intestines which were intimately adherent to it. The uterus was pushed to the left side by a fluctuating tumor as large as the two fists, which had thick walls and was filled with pus; it was formed of two inter-communicating sacs, was glued to the uterus, and seemed to be developed at the expense of the tube and right ovary, of which no trace could be found.

17. L. Tait: Pathological Importance of the Broad Ligaments. Edinburgh Medical Journal, August, 1889.

18. Bernutz (Archives de Tocologie, vol. i., 1874) quotes two cases of peri-uterine suppuration which opened in the umbilical region. The patients died. Alph. Guérin (Leçons Cliniques, etc., Paris, 1878, p. 283) reports a case where an umbilical fistula persisted for a long time, and was cured after a second pregnancy; in this latter case, it would seem as if a phlegmon of the broad ligament had come a few days after labor.

19. Trélat (Bull. de la Soc. de Chir., December 26th, 1888) has accurately described them under the title of "Complicated Cases More or Less Closely Related to Salpingitis and Long-standing Pelvic Peritonitis." He proposes to call them pelvic cellulitis, a name which I reserve for another variety. Wiedow (3d Congress of German Gynäkologists, Freiburg, 1889; Centr. f. Gynäk., 1889, No. 30) also makes a special classification of fistulous abscesses. Cases have been reported where pyo-salpinx and pelvic abscess opened into the bladder. I think the case quoted by Auguste Reverdin (Bull. de la Soc. de Chir., 1888, p. 1,016) is not conclusive, and that the vesical lesion may have been produced by the trocar and not by spontaneous perforation. Mundé's remarks (Amer. Journal of Obstet., February, 1886) show how easily the bladder may be wounded. As to the opening of pelvic abscesses into the sciatic notch, and in J. L. Petit's triangle in the lumbar region, I think that this occurs chiefly in the case of abscess in the iliac fossa from perityphlitis, or in perinephritic abscesses, rather than from suppuration of the genital tract. These various abscesses have frequently been confused.

20. Klob: Wien. med. Wochenschr., 1862, Nos. 48 and 49. Path. Anat. der weibl. Sexual-Organe, 1868.

21. Arthur H. Lewers: Note on the Post-mortem Appearances of the Broad Ligament. Trans. of the Obst. Soc., London, vol. xxx., p. 7, 1888.

22. Carter: Ibidem (21), p. 9.

23. Terrillon (Archives de Tokologie, 1889, p. 170) has shown by convincing studies that the abdominal plastron is produced whenever the inflamed appendages come in contact with the abdominal wall; the contact does not need to be immediate, but may be made by the intervention of peripheric inflammatory masses uniting the layers of the epiploön. This fact had been noticed by Polk: Amer. Jour. of Obst., 1887, vol. xx., p. 631.

24. Virchow: Arch. f. pathol. Anat., Bd. xxiii.

25. Alex. J. C. Skene (Pelvic Cellulitis, Brooklyn Med. Journal, January, 1889, vol. iii., p. 1) includes, as do many authors, under the name of pelvic cellulitis, what I call pelvic abscess and diffuse pelvic cellulitis.

26. Up to the present time the salpingitis which is the usual starting-point of the disorders has for the most part been unrecognized. We need go no further, to seek a proof of this assertion, than to Sinéty's excellent clinical picture (loc. cit., p. 815), where under the name of circum-uterine inflammation properly so-called, he ably describes the symptoms of catarrhal salpingitis, including colics of tubal origin, which he ascribes to "the constipation so often accompanying this condition, and to the presence of gas in the intestines."

27. Frarier: Étude sur le Phlegmon du Ligament Large. Thèse de Paris, 1866.

28. Peter: Notes upon a translation of Bennet's Traité Pratique de l'Inflammation de l'Utérus, p. 259.

29. N. Guéneau de Mussy: Clinique Médicale, vol. i., 474.

30. Martineau: Leçons Cliniques sur les Mal. de l'Utérus, Paris, 1880, p. 779.

31. Courty: Annales de Gynécologie, 1881.

32. Cantin: Des Lymphangites Péri-utérines non-Puerpérales. Thèse de Paris, 1889.

33. Martineau (Leçons Cliniques sur les Malad. de l'Utérus, pp. 779–780) under the influence of the theories which governed his nosology, claimed to be able to follow the course of the diseased lymphatic vessels, which felt like hardened and resistant cords. The character of the adeno-lymphitis depended upon the nature of the uterine affection; in scrofulous endometritis the ganglia were numerous, large, and not painful; in gouty endometritis, small, multiple, etc.

34. Potain: Assoc. Français pour l'Avancement des Sciences, Rouen, 1883.

35. Lasne: Pleuresie Diaphragmatique et Pelvi-péritonite, Thesis, 1887.

36. M. Duncan (Trans. of the Obstet. Society, London, May 4th, 1887) reports three cases of the ulceration of large vessels, and even of the iliac arteries from pelvic cellulitis.

37. Gosselin: Cliniques de la Charité, vol. iii., p. 56. See chapter relating to hemorrhagic endometritis coinciding with peri-uterine phlegmon, where the diagnosis should without the slightest doubt have been pyo-salpinx with perimetro-salpingitis.

38. Leroy-Broun: Pyelitis and Acute Suppurative Nephritis caused by Compression of the Ureter from a Cicatricial Mass, the Result of a Pelvic Abscess. Medical Record, New York, 1889, vol. i., p. 285.

39. Freund: Monatschrift f. Geburts., Bd. xxxiv.

40. Apostoli: Congrès de Copenhague, August, 1884. Bulletin Générale de Thérapeutique, Sept. 30th, 1887. British Med. Jour., Nov. 19th, 1887. Bröse and Nagel (Obst. and Gyn. Soc. of Berlin, March 8th, 1889, in Centr. f. Gyn., 1889, No. 16) have also often obtained excellent results. Yet Nagel acknowledges a preference for the simple and qually efficacious method of hot-water irrigations.

41. Cantin: Thèse de Paris, 1889.

42. Korn: Gynæcol. Society of Dresden, March 5th, 1887. Centr. f. Gyn., 1887, p. 451.

43. Brickell: American Journal of the Medical Sciences, Phila., April, 1887.

44. Siredey and Daulos: Dictionnaire de Médecine et de Chir. Pratiques, Art. Uterus.

45. H. Hervot: Contrib. à l'Étude de la Périmétrite. Thèse de Paris, 1887.

46. Ed. Blanc: De l'Inflammation Péri-uterine Chronique, etc. Thèse de Lyon, 1887.

47. Mundé: The Treatment of Pelvic Abscess in Women by Incision and Drainage. Amer. Jour. of Obst., xix., p. 113, February, 1886.

48. E. Blanc: Loc. cit. (46).

49. Reeves Jackson (quoted by Mundé, loc. cit., p. 119) reports a case of death from hemorrhage following an aspiratory puncture in a case of pelvic abscess. Clinton Cushing, of San Francisco, suggests the use of an instrument shaped like a glove stretcher, but pointed at the ends, so that puncture can be made with it and a tube introduced by merely separating its blades, thus obviating the necessity of an incision.

50. H. Byford (of Chicago): American Journal of Obstetrics, 1886, p. 425.

51. Hegar and Kaltenbach: Traité de Gyn. Opér., French trans. of Bar, p. 464.

52. Lawson Tait: The Pathology and Treatment of Diseases of the Ovaries, Birmingham, 1883.

53. Hegar and Kaltenbach: Traité de Gyn. Opér., French trans. of Bar, p. 464.

54. Sänger: Archiv f. Gyn., 1890, Bd. xxxvii., Heft 1.

55. Wiedow: 3d Congress of German Gynæcologists, Freiburg, 1889. Centr. f. Gyn., 1889, No. 30 and Berliner klin. Wochensch., 1889, No. 18. Sänger: Ibidem, Centr. f. Gyn., 1889, No. 31. Wiedow was the first to report a case of incision of a pelvic abscess through the sacral track. Berliner klin. Woch., March 11th, 1889. At the same time he reported a salpingotomy through the same track.

56. S. Pozzi: De la Laparotomie sous-péritonéale, etc. Bull. de la Société de Chir., April 14th, 1886. Bardenheuer: Der extra-peritoneale Exploralivschnitt, Stuttgart, 1887.

57. See the remarks in Versepuy's thesis: De la Périmétrite et de son Traitement, Paris, 1888.

58. L. Tait: Loc. cit. In July, 1889, he had operated upon and cured 38 cases of pelvic abscess. Edinburgh Med. Journal, July, August, 1889. See also Christian Fenger: Chicago Obst. Soc.; Amer. Jour. of Obst., 1886. MacKay: Lancet, Feb. 12th, 1887. Terrillon: Bull. de la Soc. de Chir., June 1st, 1887, etc.

59. Wiedow: Loc. cit. (55).

60. S. Pozzi, De Lostalot-Bachoué, and Baudron: Remarques Cliniques et Opératoires sur Trente Laparotomies. Annales de Gynécologie, May, 1890.

61. Wiedow: Zur operativen Behandlung der Pyo-Salpinx. Centr. für Gyn., 1885, No. 10. 3d Congress of German Gynæcologists, Freiburg, 1889. Centr. für Gyn., 1889, No. 30.

62. Houzel, of Boulogne: Bull. de la Soc. de Chir., 1887, p. 856. The term laparatomy (*λαπάρα*, side; *τέμνω*, I cut), used alone, should be given the meaning in general use, and signify the incision of the whole abominal wall, including the serous membrane. One of the chief features of laparatomy is that it is always more or less exploratory, for however positive may be the diagnosis, there are always some details that can be appreciated with certainty only after opening the abdomen. This exploratory character is so prominent in the incision of the flank, where the peritoneum is not cut into, but where the hand is introduced beneath it, that I believe it sufficiently resembles a true laparatomy to be classed under

the same generic title, giving it the specific and restricted name of subperitoneal laparatomy.

63. Mundé: American Journal of Obstetrics, xix., p. 113, 1886. Observations, Nos. vi. and ix.

64. Bröse (Centr. f. Gyn., 1889, p. 537) recommends the use of coils of very fine and very long wire. Out of 25 cases of painful oöphoritis and peri-oöphoritis he obtained by this method 21 cures and two cases of marked improvement.

65. Polk: Are the Tubes and the Ovaries to be Sacrificed in all Cases of Salpingitis? American Gyn. Society. September 13th, 1887, in Amer. Jour. of Obst., October, 1887, p. 1,045.

66. Freund: Monatschr. f. Geb., Bd. xxxiv., p. 380. Verhandlung der Rostock Naturforscherversammlung, 1871, p. 63.

67. Vulliet: Le Massage en Gynécologie, Paris, 1890, pp. 10–12.

CHAPTER V.

PATHOLOGICAL ANATOMY OF OVARIAN CYSTS.

From a histogenetic point of view, tumors of the ovaries have been divided into neoplasms of connective-tissue origin and epithelial neoplasms. The first group, desmoid tumors, include fibromata, sarcomata, and myxomata, all, especially the last two, of very rare occurrence. The second group, epithelial tumors, include cystomata, carcinomata or alveolar epitheliomata, and adenomata or mucoid epitheliomata. From a clinical point of view, the best division is that which separates solid from cystic tumors. The latter, being by far the more frequent, claim our first attention.

Pathological Anatomy of Ovarian Cysts.—Any portion of the tubo-ovarian apparatus may be the starting-point of cystic growths; the cortical portion and medullary portion or parenchyma; the inferior border or hilum, the region between the tube and ovary in which are found the remains of the Wolffian bodies (Rosenmüller's organ or parovarium, Morgagni's hydatid, obliterated remains of the canal of Gärtner). Essentially distinct from a histogenetic and anatomical point of view, these various neoplasms may at times be artificially placed in the same clinical category; for instance, the mere fact of a cyst being within the folds of the broad ligament is sufficient to form a well-defined surgical class. This cyst may have been developed in that situation (unilocular cyst with limpid contents), or it may have originated in the hilum of the ovary (papillary cyst) or the parenchyma of the ovary (glandular cyst) and have insinuated itself between the ligamental folds.

From an anatomical point of view, it is important to distinguish these cystic growths according to the size which they may attain. Some of moderate dimensions may be well tolerated, or else give rise to troubles which, though painful, do not threaten existence. Others, on the contrary, increase in size with the greatest rapidity from the moment that their development (their origin often goes back to embryonic life) has been started.

I will classify ovarian cysts in the following order:

Large Cysts: I. Proligerous or glandular proliferous. II. Proligerous or papillary proliferous. III. Dermoid, simple or mixed. IV. Parovarian, including several varieties—hyaline, papillary, dermoid.

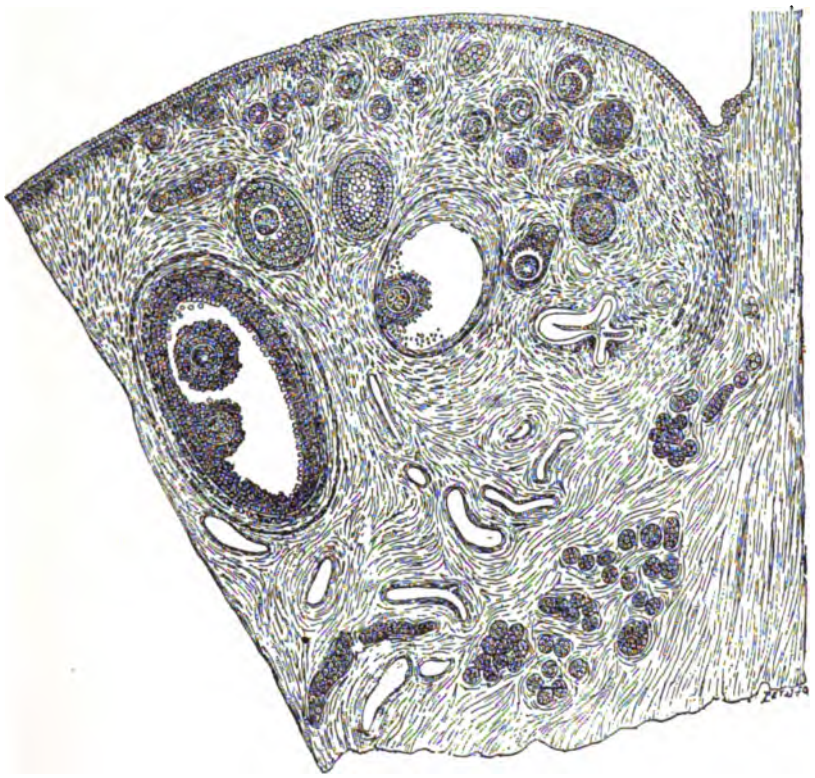

FIG. 19.—VERTICAL SECTION OF THE OVARY OF A BITCH. Over the whole extent of the free surface of the ovary is seen a layer of columnar endothelial cells (germinating epithelium, *Keimepithal* of the Germans). At one point there is a glove-finger depression which pushes a tube of this epithelium into the substance of the ovary. Just beneath is a layer of dense connective tissue in which are the young follicles and vesicles. To the left, near the centre, are two more mature follicles, with completely developed ovules. To the right is seen the stellate cicatrix of an old follicle. Here also we see the stroma of the hilum, rich in vessels, and the tubes of the parovarium in longitudinal and transverse section. The largest follicle, on the left, contains two ova, and well shows the general follicular structure; membrana fibrosa, membrana granulosa, and discus proligerus with the ovum; in the ovum we can distinguish the zona pellucida, vitellus, the germinative vesicle and nucleolus (Waldeyer).

Small Cysts: I. Small residual cysts (coming from Morgagni's hydatid, or the horizontal canal of the parovarium). II. Follicular. III. Cysts of the corpus luteum.

Finally, ovarian cysts may form anatomical connections with the tube, and constitute a separate variety, tubo-ovarian cysts.

Large Cysts.—I. and II. *Proligerous or Proliferous Cysts.*—These tumors vary greatly in appearance, yet they have a sufficient number of common characteristics to admit of a description under one head, to which may be added a few special details.

Both ovaries may be affected, but the lesions are not usually of equal development; for instance, on one side there may be an enormous tumor, while on the other there is simply a beginning of the process with scarcely any increase in size. Before closing the abdomen, the surgeon should always examine the side which is supposed to be sound.

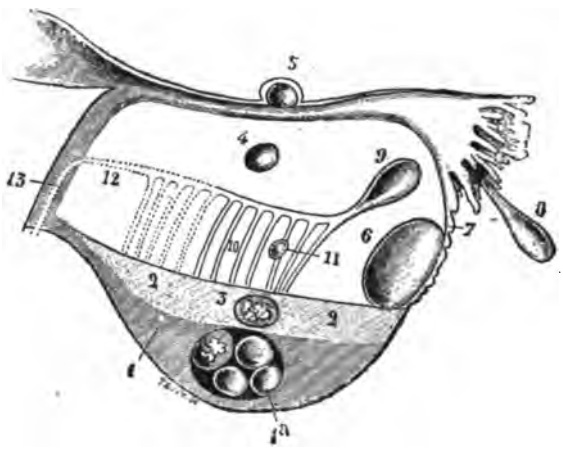

FIG. 20.—SCHEMA OF TUBO-OVARIAN APPARATUS, TO SHOW THE VARIOUS POINTS OF ORIGIN OF CYSTIC GROWTHS (DORAN). 1a, Multilocular glandular cyst developed in 1, ovarian parenchyma; 3, papillary cyst developed in 2, tissue of the hilum of the ovary; 4, unilocular cyst of the broad ligament free from the parovarium 10; 5, unilocular cyst of the broad ligament situated just above the tube but not united to it; 6, similar cyst near 7, tubo-ovarian ligament; 8, hydatid of Morgagni, which is never the starting-point of a large cyst; 9, cyst developed at the expense of the horizontal canal of the parovarium; 11, cyst developed at the expense of the vertical tube. According to Doran, these are the papillary cysts of the broad ligament; 12, 13, course of the obliterated canal of Gärtner; papillary cysts may be developed at any portion of this canal (Coblenz), and these may be the origin of papillary cysts connected with the uterus, 13.

The tumor may be so voluminous as to entirely fill the abdomen, pushing out the costal cartilages in such a way that after the tumor is taken out the patient looks like a gutted fish. The shape is spherical or ovoid, but with nodules corresponding to weak spots in the walls which have yielded to internal pressure. At the thickest portion of the walls, the color is pearly white or bluish, and marbled by the veins; in the thinner portions the color is purplish, greenish, or blackish according to the nature of the contents. The external surface, smooth and oily, is sometimes covered with small papillary growths resembling frogs' spawn or the vegetations of certain mucous patches. The tumor is usually pediculated.

The internal structure varies acccording to the number of pockets and their contents. Cruveilhier divided cysts into unilocular, multilocular, areolar, and compound. This classification need not be retained; but for the purposes of description it is well to keep the words areolar, unilocular, and multilocular.

We know that the first-named variety is due to the destruction of intervening walls whose remains are found in the shape of spurs or trabeculæ. One pocket is usually larger than the others, though there may be several pockets of equal size; by the side of cavities

FIG. 21.—PROLIGEROUS GLANDULAR OVARIAN CYST OF AREOLAR APPEARANCE.

containing several quarts, we find small cysts the size of an orange or a nut.

Sometimes a large part of the tumor may be formed by the agglomeration of very small cavities separated by a more or less dense tissue (occasionally gelatinous) giving the section a honeycombed appearance (Fig. 21). In cysts which are considered to be unilocular, and which surgically deserve the name, the pathologist will nearly always find a certain number of secondary cavities in the thickness of the walls.

The cystic pouch can often be separated into three distinct layers, especially near the pedicle; the external layer is fibrous, the middle layer of connective tissue, the third is formed of a capillary network covered by epithelium. The veins, which may be as large as the

femoral or even the vena cava, ramify upon its external surface, and adhere to it like sinuses, which makes it a dangerous matter to wound them. We occasionally see large bands of unstriped muscular tissue spread out upon the tumor, near the pedicle.[1] The endothelium covering the external surface is columnar, thus differing from the flat endothelium of the peritoneum. The internal surface of the cyst is covered with very low cylindrical cells. Waldeyer describes one layer, Rindfleisch several. Malassez and De Sinéty[2] lay much stress upon their polymorphism. They found a layer of sub-epithelial endothelium, and showed that in the same type of cysts the most varied forms of epithelium, metamorphosed and superposed, may be met with. They pointed out the importance of the goblet cells in maintaining viscidity of the cystic fluid; and finally, they showed the analogy between the cells derived from the normal type met with in cystic growths, or metatypical cells, and that of the glandular epithelioma of the mammary gland.

In a section of the walls we find depressions of the lining endothelium, which give the appearance of acinous glands with a narrowed opening. We also find, on the internal surface of cysts, vegetations formed by a proliferation of the stroma, which resemble myxoma or fibro-sarcoma; they are covered with a single layer of endothelium, and have a tufted appearance. Sometimes epithelial prolongations of a tubular form penetrate them from below upward, and give them the appearance of carcinomata; small cysts may also develop in these papillæ.[3] In spite of the hybrid forms so often met with, it is well to follow Waldeyer in distinguishing neoplasms in which the chief vegetations come from the epithelium and lead to the formation of glandular tubes (proliferous glandular cysts), from those where the connective tissue of the walls is the part which develops and projects in the form of vegetations into the interior (proliferous papillary cysts). To be sure, as Quénu[4] remarks, the process of proliferation is the same in both cases, taking place superficially in one variety, deeply in the other; but the appearance of the neoplasm is, nevertheless, greatly altered, according to whether the epithelial or connective-tissue elements predominate. There is, moreover, a mixed variety of papillary and glandular cyst. The proligerous or proliferous glandular cyst is characterized by a great number of small glands in the cystic walls. Newly formed glandular tubes are transformed into cysts by the following process: Their orifices opening into the principal cystic cavity become obstructed and obliterated; the other end

dilates, new glandular tubes develop and in turn pass through a cystic phase and give rise to a new glandular growth. The multiplication of glands may become excessively great.

Proligerous or proliferous papillary cysts show the indications of an abundant proliferation of connective tissue; this projects into the cyst cavity in the shape of small buds pushing aside the epithelium and dividing into ramified papilliform masses. These branching excrescences may so distend the cyst as to burst it open, and appear on the outside, either through a small crack or a large tear. Then the cyst may turn its convexity inside out, showing the vegetations upon

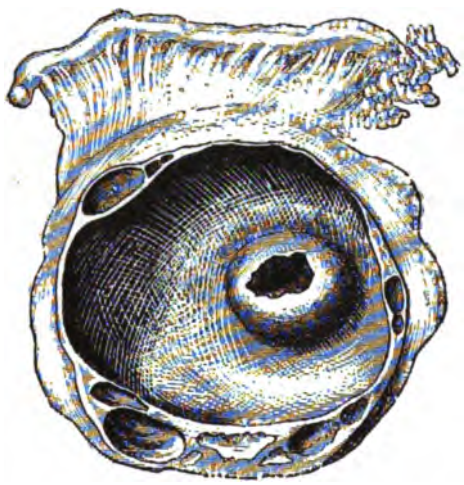

FIG. 22.—SMALL GLANDULAR MULTILOCULAR PROLIFEROUS CYST (DORAN). The section of the wall shows accessory cavities; in the interior of the cyst is one of these pouches broken open.

is surface, and the whole tumor changes its aspect. At the same time, the secretions fall into the peritoneum and cause ascites and the metastatic production of disseminated papillary masses. Tumors originating in this manner have often been described as superficial papillomata* of the ovary, whereas they are due to a previously existing cyst whose dehiscence caused their appearance. Yet vegetations may apparently arise spontaneously upon the surface of the ovary. Prochaska, Gusserow and Eberth, Birch-Hirschfeld, Marchand, and Coblenz[5] quote cases in illustration. Such cases as these,

* The word *papilloma* having already received a different histological signification is unsuitable to use in this connection, and will only be employed as a descriptive appellation without histological classification. Terrier wisely called attention to this fact.

however, should really be described with dehiscent cysts, and the two cases studied by Coblenz plainly show this relationship; the stroma of the ovary contained in both cases epithelial cells which were in process of transformation into cystic cavities, and in the last case papillary growths had even begun to form within the small cysts. Upon the surface of the ovary, by the side of the large papillary mass, may be seen small vegetations which spring from the depressions left

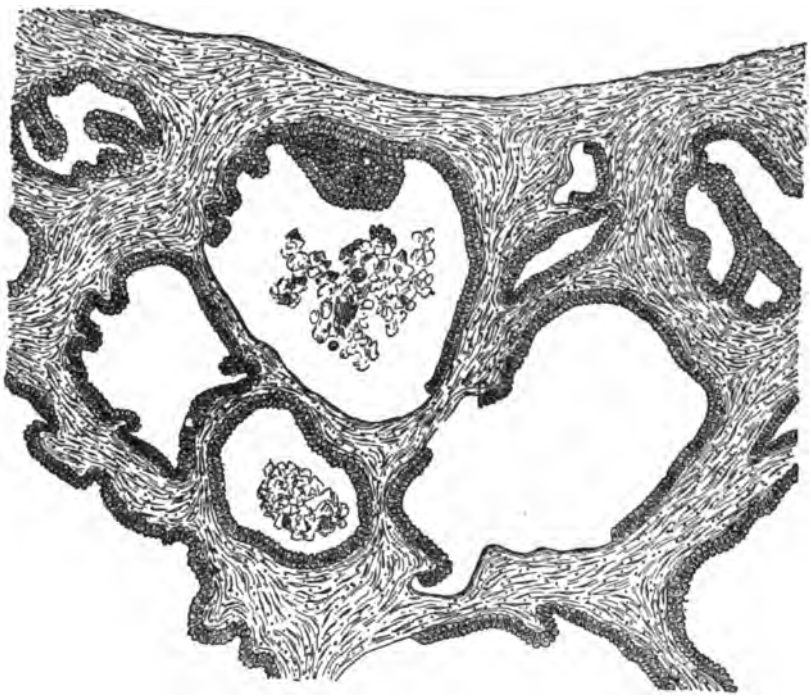

FIG. 23.—GLANDULAR PROLIFEROUS CYSTS OF THE OVARY (WALDEYER). This cut is designed to show the genesis of a proligerous multilocular glandular cyst, which grows at the expense of the glandular tubes of the ovary. The section of these glandular tubes (of Pflüger) shows them to be normal. To the right and above, we see several of these tubes already somewhat enlarged, near together, and separated by a thin layer of connective tissue. We also see how two cavities become fused and form a cyst by the destruction of the intervening wall. To the left and above, in a medium-sized cavity, we see a spur-like prolongation which is probably the remains of the partition between two vesicles that have become cystic. The lower part of the section contains larger cavities with slight elevations and depressions. The glandular tubes and the cysts are lined with columnar epithelium. The contents of the cyst escaped during the preparation of the specimen; in one spot alone we can see a small mass of cells. The stroma is fibrous and contains a number of round and spindle-shaped connective-tissue cells.

by the bursting of the superficial cysts. We may then assert that superficial papilloma of the ovary is merely the product of the dehiscence of very small superficial papillary cysts. This will explain the cases sometimes found of a papillary cyst upon one side, and a papilloma of the ovary upon the other.[6]

Papillary cysts are often found within the folds of the broad ligament, for they arise from the remains of the Wolffian bodies, or from the hilum of the ovary into which these vestiges penetrate (Doran); originating thus from the border of the ovary, the tumor in developing naturally insinuates itself into the ligamental folds. In this position they grow more slowly, and also give rise to symptoms of compression, as do all intra-ligamental growths, bound down against

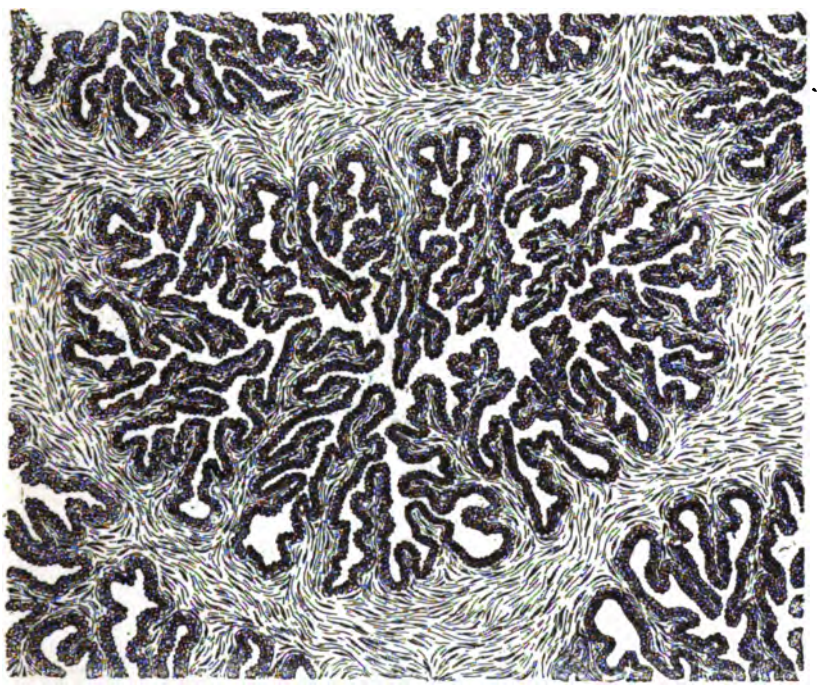

FIG. 24.—PAPILLARY OVARIAN CYST (WYDER). (Section from a tumor filled with cauliflower vegetations which in several places penetrate into the walls.) The cystic cavities are separated by dense connective tissue. A few vascular and branching fibrous bundles rise from the cyst walls and project into the cavity, giving it a cauliflower or papillary appearance. They are covered by a single layer of medium-sized columnar cells. (In some cavities of the cyst there were no papillæ; the walls were smooth or had a few small and non-branched projections.) A viscid milky fluid filled some of the loculi; in some the fluid was clear.

the pelvic walls. The papillary vegetations may penetrate the capsule not only in the direction of the peritoneal cavity, but below, causing adhesions between the cyst and the pelvis, bladder, rectum, or uterus. The fundus uteri has been invaded by such growths.[7]

It is not a very rare occurrence to find calcareous grains, like grains of sand, in the papillary growths (corpora arenacea). They are somewhat analogous to the lime sometimes deposited in a placenta,

Calcareous concretions are found in other vascular tumors, as those of the arachnoid membrane, cavernous angiomata, etc., which are called psammoma.

The mode of origin of proligerous cysts of the ovary (glandular and papillary) has given rise to numberless controversies, not yet at an end. The old idea of hydatids was replaced in 1807 by Meckel's theory of hydrops of the Graafian follicle. Huguier and Bauchet[8] accepted the follicular theory for simple unilocular or multilocular cysts only. After the investigations of Cruveilhier, Virchow, and Rokitansky,[9] a new growth with areolar or colloid degeneration of

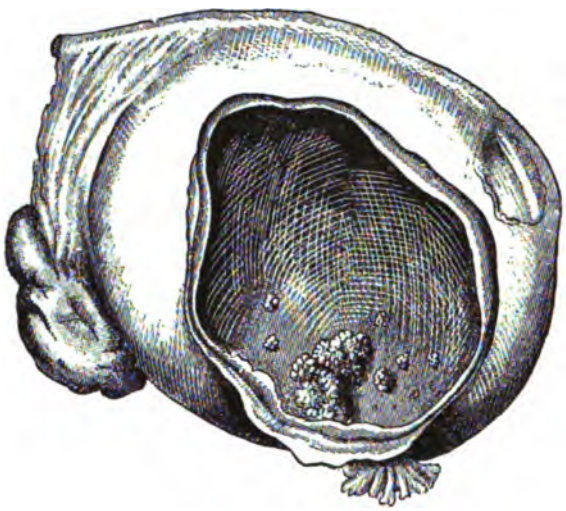

FIG. 25.—PAPILLARY CYST STARTING FROM THE HILUM OF THE OVARY (DORAN). On the left lower extreme of the picture is the ovary, which is almost intact. The cyst is developed within the broad ligament, which is opened so that we may see above a portion of the Fallopian tube. An opening has been made in the cyst wall to show the papillary vegetations within.

the ovary was generally admitted in cases of the more complex forms. The stroma and its colloid degeneration at that time received all the attention, and the epithelial element was entirely lost sight of; it was the same with the researches of Rindfleisch and Mayweg.[10]

The restoration of the epithelial element in the origin of proligerous cysts was accomplished chiefly by Klebs and Waldeyer.[11] I will give a *résumé* of Waldeyer's theory, which is accepted by many authorities. It is well known that in the embryo the ovary contains many epithelial tubes derived from the germinal epithelium covering the surface of the ovary. These tubes of Pflüger are destined later to divide and diminish in order to produce the Graafian follicles which are a product of secondary evolution.

(I have borrowed from De Sinéty the following items of information regarding germinating epithelium, primordial ovules and Pflüger's tubes.

In the early stages of embryonic life, about the fourth day of incubation in a chick, a slight thickening of the epithelium is seen in the anterior portion of the Wolffian body. A small spot of connective tissue is simultaneously developed just below this epithelial thickening. Among the cylindrical cells which constitute the larger part of the epithelial mass, called by Waldeyer the germinal epithelium, may be seen a few larger, rounder, nucleated cells; these are called primitive ova. In order to study the first stage of this development in the human being, Waldeyer advises the choice of a fœtus about

FIG. 26.—PAPILLARY OVARIAN TUMOR, COVERING THE WHOLE OF BOTH BROAD LIGAMENTS.

four and a half inches in length. In a fœtus of three or four months, the ovary is almost entirely composed of what will later be developed into the cortical substance. The medullary substance, formed of blood-vessels and embryonal connective tissue, looks in transverse section like a pedicle separated from the cortical substance, with which it communicates to a very limited extent only. At five months the ovary shows important modifications. The bundles of connective tissue are thicker and more abundant and clearly define the utricles or tubes of Pflüger or Valentine, called by some anatomists cordons glandulaires. We can at this stage study the formation of the primitive follicles by the constriction of the epithelial follicles. Some isolated primitive follicles may be seen, in which we can clearly distinguish the ovum with its vesicle and germinal spot, surrounded by a layer of epithelial cells, and a limiting layer of

connective tissue. At term we still find germinating epithelium composed of two kinds of cells on the surface of the ovary; but the round cells have become much fewer in number. The anastomosing ovarial tubes are for the most part separated from the external epithelium by a thin layer of connective tissue. Still, a few may be seen in which there is direct communication between their contents and the germinating epithelium; this anatomical peculiarity has even been known to persist in the adult.)

Pflüger's tubes are still to be found in a new-born infant, and may persist abnormally or be formed by heterochronia in the adult. Their persistence to quite an advanced age has been proved beyond a doubt, and Slavjansky [12] has found them slightly cystic in the ovary of a woman thirty years of age. These tubes may exceptionally be transformed into cysts, before the age of puberty, and in the newly born some have been found of the size of a pea, increasing in size only after puberty.[13] We may then state that not only are all ovarian cysts congenital, but many of them are congenitally formed and either remain stationary or develop at some later period.

When a cyst is formed at the expense of the glandular tubes of Pflüger, the most central cells soften and liquefy, and the walls of the distended tubes acquire vegetations and give rise by budding to new tubes. The most complex cyst is in the beginning nothing but a small pouch of connective tissue lined with epithelium, which is merely primitive glandular epithelium, partly liquefied to form the cyst contents. The fusion of several of these primitive cysts may end in the formation of enormous cavities; all unilocular cysts are multilocular in the beginning (Waldeyer). I have already shown how the vegetation of the walls gives rise to papillary projections whose name is given to an important variety of ovarian cyst.

Malassez and De Sinéty [14] do not admit the important rôle attributed by Waldeyer to the tubes of Pflüger.

In their opinion, the germinating epithelium on the surface of the ovaries is the source of the neoplasmic growth, and the process begins by epithelial invagination; but this new epithelial growth, which physiologically should form the tubes of Pflüger and finally the Graafian follicles, in a pathological condition becomes diverted into a less specialized and less elevated channel, and is developed only into the ordinary lining epithelium, giving rise to more or less spherical tubes or cavities which have but a remote resemblance to the tubes of Pflüger and the follicles. Struck with the resemblance be-

tween the epithelium of these tumors and the lining of normal mucous membranes, Malassez proposed to call them mucoid epitheliomata.[15] This name, though histologically correct, causes some confusion clinically, where the name epithelioma, by long usage, conveys a meaning of malignity; the same may be said of the term cysto-epithelioma adopted by some writers.[16] The name of proligerous cysts seems to me preferable.

Is the histogenesis of papillary cysts different from that of glandular cysts? In 1877, Olshausen suggested the hypothesis that they came from the parovarium, after Waldeyer had shown that it penetrated into the hilum of the ovary. The reasons given were the presence of columnar epithelium, and the frequency of inclusion of these cysts within the broad ligament. Fischel carried the subject further, and asserted that these tumors sprang from the cells of the membrana granulosa, which, according to his opinion, originated in the Wolffian bodies.[17] In spite of the support given by Doran to this view, by the exhibition of specimens in which the ovary was seen to be by the side of a papillary cyst springing from the hilum (Fig. 25), we could not at the present day unreservedly accept this opinion. In fact, Marchand and Flaischlen[19] have shown that these cysts may develop upon the surface of the ovary, and that in this case they contain ciliated epithelium continuous with the germinating epithelium. According to Marchand, it is easy to understand that the ciliated epithelium of the papillary cysts may be pathologically derived from the germinating epithelium, since this filiation occurs normally with the epithelium of the Fallopian tubes; as to the papillary structure, that also is found in the mucous lining of the tubes, and there is nothing surprising in the fact of such an arrangement being produced in a morbid state of tissues similar to one another.

Upon the whole, we may conclude that the germinating epithelium is the point of origin of papillary as well as of glandular cysts. It must be acknowledged that this idea of a common origin is not entirely satisfactory. How shall we account for the marked differences between these two species of neoplasm, and for the very special characteristics of the papillary growths? How explain the fact that they are so often bilateral, so frequently subserous, and so much oftener malignant? There can be little doubt that further researches are needed upon the subject.

In a study of the fluid contents of cysts, I will consider all the proligerous cysts together, although they differ markedly according

to whether the cavity is glandular or papillary; still, we must not forget that both kinds of cavity may be seen upon the same tumor.[20]

In general, we may say that the fluid of large cavities is more tenuous than that of small ones. Except in the majority of par-ovarian cysts, where it is as clear as a mountain stream, and non-albuminous unless there be inflammation or a discharge of blood, the liquid of ovarian cysts has a more or less oily consistency; it is somewhat viscid (filant), sometimes syrupy. The color varies from the yellow of barley-sugar, or an apple-green, to a coffee- or chocolate-brown; these darker colors are due to the presence and decomposition of blood.

Cholesterin crystals are sometimes met with, and in small cysts we may see rice-shaped bodies. In papillary cysts, owing to the absence of goblet cells, the liquid is never as viscid as in the glandular cysts.

At one time great hopes were entertained in regard to the chemical composition of the cystic fluid, but they have been somewhat disappointed; it was hoped that in cases of doubtful diagnosis the fluid could be distinguished from that of ascites. Waldeyer considered paralbumin[21] to be characteristic of ovarian cyst. It seems to be nearly constant in the glandular cysts; papillary cysts may contain merely a trace. Out of twenty-three cysts examined for the purpose of establishing this fact, Oerum[22] found paralbumin in eighteen cases; in five cases it was absent. I would add that this substance has been found in the sputum of bronchitis, in a cyst of the neck, in the urine of patients with suppurating diseases of the bones, and even in some cases of ascites. For the technical details of the researches in regard to paralbumin, consult the writings upon this subject of Huppert and Hammerstein.[23]

Another valuable datum furnished by chemical analysis, and one which seems more positive, is drawn from the amount of solids in the various fluids. According to Méhu, if there are two ounces and two drachms to the quart, it is certainly an ovarian cyst. According to Quénu, this estimation is too low, and should be raised to three ounces two drachms, and it would then be a valuable indication.[24]

III. *Dermoid Cysts.*—These are usually small, but they may become voluminous by uniting with proligerous cysts, or even in consequence of an acute inflammatory attack which suddenly increases their fluid contents. Though they may be long unrecognized, and perhaps revealed only by chance at the autopsy, as soon as they begin

to enlarge they approach, from a clinical point of view, the ordinary or proligerous cysts that I have just described. Poupinel[25] has gathered data in regard to forty-four cases where both ovaries were transformed into dermoid cysts.

They are much less frequent than proligerous cysts. Olshausen collected statistics of 2,275 cases coming from a series of ovariotomies performed by Spencer Wells, Keith, Schröder, Krassowski, A. Martin, Billroth, C. v. Braun, Esmarch, Dohrn, and himself. Out of this number there were only 80 dermoid cysts (3.5 per cent).

Their internal surface is covered with a membrane which looks like the skin and which has a similar structure: we may see on it a

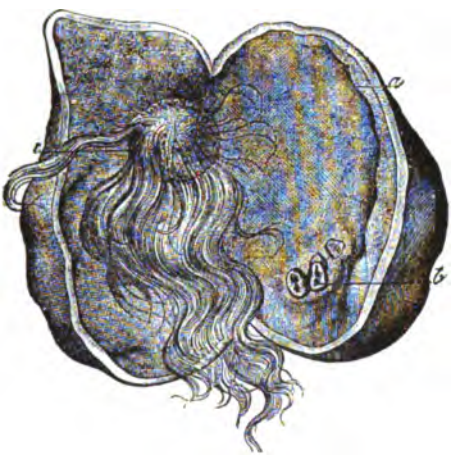

FIG. 27.—DERMOID CYST OF THE OVARY.

corneous layer formed of several layers of flat and then spherical cells, like those of the rete Malpighii.

A panniculus adiposus separates the dermic layer from the fibrous capsule of the cyst. Upon the surface of the derma are papillæ which may look like nipples[26] and some hairs which are inserted into hair follicles occasionally provided with a sebaceous gland; the latter were first demonstrated by Friedländer. Sudoriparous glands are also found. The hairs, whether free or implanted, are long, tawny, agglutinated together by sebaceous matter, and sometimes rolled into little balls. Sebum resembling the vernix caseosa partly fills the cavity, and often forms small, isolated masses; it is sometimes oily in consistency, and contains many epithelial cells, cholesterin crystals, and fatty acids. Teeth and bones have been found in these cysts; the bones are inserted in the wall, and more or less covered by the dermic layer; they

are irregular in shape, usually flat, and formed of compact tissue; cartilage is present in small patches, which, according to Labbé and Verneuil, sometimes articulate by means of intervening fibrous bundles.

The teeth project into the cavity, and are often loosely inserted into alveoli formed of bony débris. They are never perfect in shape, and cannot be absolutely identified as incisors, canines, or molars;

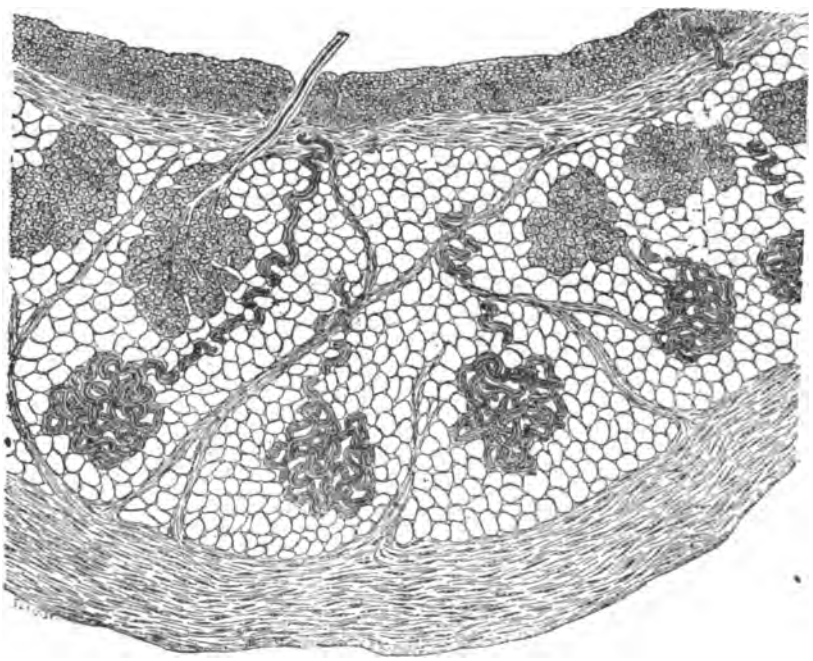

FIG. 28.—DERMOID CYST OF THE OVARY (WYDER). The cyst was filled oy a fatty mass enclosing reddish hairs. The structure of the wall is seen to be like that of the skin. The upper stratum in the cut. (the inner layer of the cyst) is formed of closely packed cells, flattened toward the surface by mutual pressure. Beneath are two layers of fibrous connective tissue separated by loose adipose tissue. The fibrous stroma of the latter is formed by fibrillæ from the two connective layers. An important detail of this specimen is the presence of sudoriferous glands by the side of sebaceous glands and hair follicles.

the cement is usually absent. Hollaender makes the interesting statement that the teeth are always placed with their crowns sloping toward the median plane of the body, so that an examination of the cyst cavity will always determine the side of the body upon which it originated. As many as a hundred teeth have been found in one cyst (Schnabel). Autenrieth describes a case where three hundred teeth were taken out of a cyst, which contained even more. Some writers claim to have found carious teeth, but, as Lannelongue[27] observes, Magitot is probably correct in thinking that this is not really caries,

but a phenomenon of wear and absorption. P. Ruge[28] found in a dermoid cyst, just below a bone which resembled the inferior maxillary with its molar teeth, a small mass which in form, size, and acinous structure had every appearance of a submaxillary gland.

Unstriped muscle fibres have been found in the dermic layer (Virchow); as to the striated fibres, Olshausen denies their existence, saying that where they are found the case is probably one of teratoma instead of dermoid cyst. In truth, many authorities confuse the two. Cruveilhier[29] quotes a case where nails were found, Baumgarten[30] reports a most remarkable case where the cyst, besides skin, hairs,

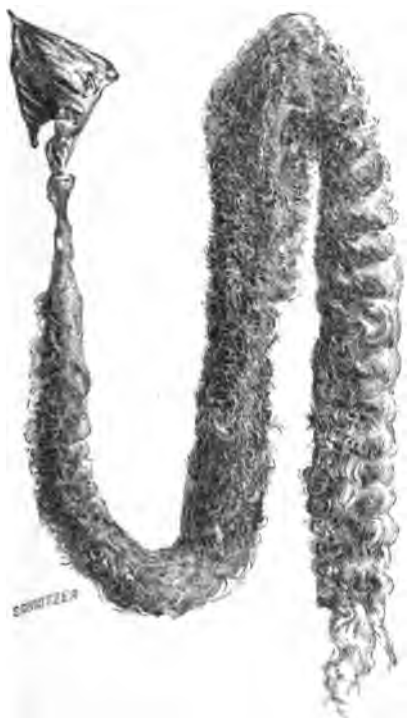

FIG. 29.—SWITCH OF HAIR FIVE FEET LONG TAKEN FROM DERMOID CYST (MUNDÉ).

FIG. 30.—BALLS OF SEBACEOUS MATTER MINGLED WITH SHORT HAIRS FOUND IN A DERMOID CYST (MUNDÉ).

and teeth, contained a body which resembled an eye, with a species of convex cornea and epithelium like that of the retina. There was also a mucous membrane similar to that of the intestines and stomach, and encephaloid nerve substance.

The presence of gray matter in dermoid cysts is a knotty point. In one case Virchow found gray matter, laminated as in the cerebellum; Key found some enclosed in a bony cavity; Rokitansky,[31] in a species of capsule near a bone; other pathologists have, in exceptional cases, found nerve filaments supplying the teeth.[32]

Besides these solid substances, dermoid cysts contain a milky fluid in which are often found cholesterin crystals.

Mixed tumors, formed by a combination of dermoid with other forms of ovarian cysts, have long been known.[83] The subject has recently been studied by Poupinel, who states that in one and the same tumor we may find in closest union dermoid cysts and cysts with pavement epithelium, cubical, ciliated, goblet, polymorphous cells, etc. More than this, in the same cystic cavity we may find the epidermis with its appendages (hairs, sebaceous and sudoriparous glands) and a lining of uniform or polymorphous epithelium. Finally, the interior lining of the cavity may be entirely formed of skin—which may, however, be incomplete. In some instances, the cutaneous lining is found in a few places only of the dermoid cavity, and may be in the form of large papillæ into which are implanted the hairs. The rest of the cyst wall is smooth and fibrous, or else looks more mucous than cutaneous.

The foregoing description, which agrees with all other accounts of dermoid cysts, leads one to regret the rarity of thorough histological examinations. Were they more frequent, it is probable that many cases of so-called dermoid cysts would be classed with mixed tumors. The fibrous stroma is usually formed of young connective tissue, of adult or of myxomatous tissue. Yet, besides teeth, which are produced from the ectoderm and are met with only when there is a cutaneous lining, we find cartilaginous and bony tissue in the fibrous walls of mixed tumors. It may also be seen in tumors which possess no dermoid characteristics. Poupinel[84] reports an example of a mucoid cyst of the ovary, followed by the appearance of cysts of the same nature all over the body; cartilaginous nodules were found in its walls.

Mixed tumors, as well as dermoid cysts, often ossify; but a study of their structure emphasizes the interesting fact that the fragments of bone are not necessarily situated near the dermoid cysts, but may indeed be quite independent of them. Finally, we may find striped and unstriped muscle fibres and nerve tissue in the stroma of mixed tumors.

Both ovaries may be simultaneously affected. In that case, as in the case of unilateral ovarian tumors, combinations of every variety of cyst may occur. Each ovary may contain an epithelial mucoid tumor, with polymorphous epithelium or epithelium of one kind alone. For instance, both cysts may be lined with ciliated epithelium

(Brodowski, etc.). Oftentimes both ovaries are transformed into mixed tumors (Flesch, Neumann, and Poupinel).

There may be a dermoid cyst upon one side and a mucoid cyst upon the other (Lebert, Young, Herchl, Mugge, etc.), or a mucoid cyst on one side and a mixed tumor on the other (Poupinel). The question of the origin of dermoid cysts is one of the most obscure points in general pathology.[35] The theory which ascribed them to extra-uterine pregnancy scarcely deserves mention, since they are often met with in children. The theory of diplogenesis by fœtal inclusion is also inadmissible, and is at once disproved by the great number of teeth present. The term plastic heterotopia, used by Lebert, is no explanation, but merely a name.

There are a few more tenable theories; that of parthenogenesis, which considers their formation due to a proliferation of germinating epithelial cells, is not satisfactory, because it fails to account for the presence of similar growths in other parts of the body where there is no epithelium. The theory of impaction, although not beyond criticism, is on the whole the most satisfactory. According to this view, during intra-uterine existence certain portions of the blastoderm become impacted by pressure within the tissues, and develop there later, giving rise to an irregular formation of the normal tissues. Verneuil was the first to formulate this ingenious theory in regard to cysts of the branchial clefts of the neck and of the head.[36] The demonstrations of His in regard to the axis cord, from which he claims that the genital organs are developed, assist us in understanding the complexity of the elements found in dermoid cysts of the ovary. The organs which are formed by all the layers of the blastoderm are the only ones which take part in the formation of the axis cord. It is impossible by dissection to identify the different germinative layers; we can easily imagine, therefore, that portions of tissue corresponding to the corneous layer, the medullary tube (ciliated epithelium), or the middle layer (muscles, bone) may become misplaced in the ovary as in the testicle. The theory of impaction receives strong corroboration from these researches.[37] Lannelongue[38] adopts it unreservedly. He calls attention, moreover, to the fact that the development of these tissues, foreign to the parts in which they are situated, brings about certain modifications in the structure of the latter, which add to the complexity of the abnormal growth. Perhaps this may explain the union of proliferating ovarian cysts to dermoid cysts, and the various transitional stages in these neoplasms. Still, Lannelongue does not

entirely reject the idea of diplogenesis in cases where fœtal remains are found in cysts, which he terms fœtal cysts. He considers them to be a combination of cysts and double monsters; the cause giving rise to the production of the monster being intimately associated with that which determines the formation of a cyst. One or the other may predominate, according to the case; the higher we go in the series, the more does the element of the monstrosity predominate, and the more does the cystic element tend to diminish and disappear. Thus, in the genesis of these tumors, there are two factors to be considered—the production of cystic cavities, and the existence of a centre of supplementary development. To admit the existence of this independent centre is to satisfactorily account for the complex character of these neoplasms, but it must be confessed that the admission creates problems quite as difficult of solution as those which it destroys.

IV. *Parovarian Cysts.*—From a practical standpoint, it is impossible to separate cysts of the ovarian region which are independent of the ovary from those properly called ovarian cysts. Therefore, although the cysts of which I am about to speak are not in reality cysts of the ovary, since anatomically separate from it, yet they are best described in connection with the latter, being surgically and clinically so closely connected to them.

These cysts are formed into a clearly defined group, by an *ensemble* of like characteristics. They are usually called parovarian cysts, or cysts of Rosenmüller's[39] organ, because their origin in the broad ligament, where they are situated, corresponds to the seat of these embryonic remains, and because it seemed natural to give a special name to a specialized structure. But it has not been demonstrated that these unilocular cysts of the broad ligament, with their thin walls and transparent contents, always originate from the parovarium. A. Doran[40] has studied and made drawings of some specimens which antagonize this theory. He inclines to the belief that they are simple cysts with lacunæ or the subserous hygromata of Verneuil. Mangin[41] also believes that they may be developed in the connective tissue, independently of the parovarium. De Sinéty[42] considers it very doubtful if they originate from the organ of Rosenmüller. He believes them to be similar to mucoid epitheliomata, and thinks that the difference in the fluid contents is due to the simple structure of the epithelial cells, for a clear fluid is also seen in proligerous ovarian cysts not lined with goblet cells. De Sinéty even wonders whether supernumerary ovaries may not have something to do with the production

of these cysts. But, if their origin be the same as that of ovarian cysts, how shall we explain their constant, special structure? Moreover, how can we believe in so frequent an existence of supernumerary ovaries? There are certainly some nebulæ upon this point which need to be cleared away. Yet it is convenient to use the time-honored expression parovarian cyst to designate cysts of the ovarian region, independent of this organ which is found to be in normal condition close to the cyst, or separated by a fold of the ligament; only the name should be understood to mean a cyst in the vicinity of the ovary, rather than a cyst of the parovarium.[43]

FIG. 31.—UNILOCULAR PAROVARIAN CYST OF THE BROAD LIGAMENT. To the left and above is the incised ovary, which is seen to be free. The elongated Fallopian tube is spread over the surface of the cyst (Doran).

These neoplasms are not rare: Olshausen has found them 32 times among 248 ovariotomies, which is 11.3%.

It is important to divide them into two classes; the first, and more frequently met with, I shall call parovarian hyaline cysts, the second, parovarian papillary cysts.

Parovarian Hyaline Cysts.—These are usually unilocular, but there are some exceptions. L. Tait[44] reports a case upon which he operated and which he carefully examined, where there were six sacs joined together, and he also states that Spencer Wells removed a bilocular cyst. Moreover, even when there seems to be but one cavity, a careful search will often reveal secondary cavities in the cyst wall, of the size of hempseed or peas.

The sac is very thin. Its external surface, wherever it is not in

contact with the pelvic walls or neighboring organs, is covered by the folds of the broad ligament, which do not, however, adhere to it. In many cases, a sort of prolongation of the broad ligament seems to form a large pedicle. When the cyst is sessile, it is but loosely joined to neighboring parts, unless there have been previous inflammation.

Its color is white of a slightly greenish tint, and the fine blood-vessels of the investing peritoneal membrane clearly show through. The tube adheres to the surface of the cyst, the first effect of its development having been to open out the tubal folds; the ovary is thrown to the external side, sometimes flattened, but always distinctly visible. The internal surface is smooth and lined with ciliated epithelium, which may be accompanied by ordinary columnar epithelium. The fluid is limpid and of a crystal clearness, its density scarcely greater than that of water (1,002 to 1,008). It is not precipitated by heat, for it contains no albumin if there have been no suppurative process nor effusion of blood.[45] It contains a large proportion of sodium chloride.

Parovarian Papillary Cysts.—Besides the more common parovarian hyaline cyst of the broad ligament, with its smooth walls and transparent fluid contents, there is another variety characterized by the presence of papillary growths. Is this variety of separate origin, or is it, according to L. Tait, simply a stage of further development of the other? This question we cannot answer. However that may be,[46] it is important for us to know that this variety exists. For a long time there existed a certain amount of confusion in the science of gynæcology owing to our incomplete knowledge of this subject. On the one hand, some writers erroneously used parovarian cysts and cysts of the broad ligament as synonymous terms; on the other hand, many believed that parovarian cysts always had thin walls, and transparent, non-ropy fluid contents, poor in albumin. Now this variety, though the more frequent, is not the only one. There are parovarian cysts with viscid contents, for which result it is only necessary that they should have papillary growths; the contents may even be made albuminous or of various colors by recent or past extravasations of blood. Yet these characteristics should not lead to a confusion of these cysts with mucoid ovarian cysts[47] exceptionally enclosed within the folds of the broad ligament. They possess one special characteristic, in that they are always unilocular (except for the almost microscopic cavities in their walls), while ovarian cysts are almost invariably multilocular. Cases which have caused confusion have been only apparently similar.

Exceptionally the cysts, especially if they develop in the direction of the abdomen, become to a certain extent mobile, and, by dragging upon the broad ligament, form a kind of laminated pedicle.[48] These cysts, which are ordinarily benign, may sometimes become malignant in the extreme. L. Tait quotes the case of a young girl from whom he removed a parovarian cyst of apparently simple nature, and without any interior vegetations; six weeks later the patient showed symptoms of ganglionic infection, and three months later died from metastatic cancers in various organs.

Parovarian Dermoid Cysts.—A certain number of well-authenticated free dermoid cysts of the ovary have been reported.[49]

Imperfectly Developed Cysts—I. *Small Residual Cysts, Wolffian and Müllerian.*[50] (Bland Sutton publishes some interesting facts of comparative anatomy relative to lesions of the uterus and ovaries in the lower animals. These lesions are more frequent among domesticated animals than among wild ones.

Cysts originating in the vestiges of the Wolffian bodies are quite frequent among the batrachia. Out of 250 frogs and toads, Sutton found 10 cases. In birds and batrachia, we know that only the left canal of Müller persists and forms the oviduct. The right one disappears and inosculates, in the shape of a little cæcum, with the cloaca. This small rudimentary canal is often the starting-point of cystic growths. The following is a curious fact: whenever a female poultry-yard fowl has feathers and gait resembling those of the male, the ovary will usually be found affected. In old mares, cysts of the tubes and ovaries are so frequent that two-thirds of them are thus affected; they have been found in cats, goats, etc.)

In uterine fibromata and ovarian tumors at the start, we often find either in the broad ligament or on the tubes small transparent vesicles, which are of no surgical interest, but whose anatomical significance is worthy of consideration. They are of three kinds:

a. *Cyst of Morgagni's hydatid* (Fig. 20, 8). Suspended from the fimbriated end of the tube, varying from the size of a pea to that of a cherry, transparent, covered with a single layer of endothelium. We know that this hydatid is the remains of the extremity of the canal of Müller.

b. *Supra-tubal cyst* (Fig. 20, 5) is no larger than the preceding, and has the same appearance and structure. It is probably a microcyst of the broad ligament which has slipped under the serous membrane and worked its way up to this unusual position.

c. *Micro-cysts of the Broad Ligament.* Some of these are suspended from Rosenmüller's organ (Fig. 20, 9, 11), some are free and of undetermined origin. According to Doran, only those which originate from the vertical tubes of the parovarium contain ciliated epithelium and develop into papillary growths; the other cysts which start outside of the parovarium (Fig. 20, 6, 4), and even those which start from the horizontal tube and which may become detached from the broad ligament by means of a slender pedicle (Fig. 20, 9), are covered by a layer of simple endothelium only.

We cannot assert that the micro-cysts of this third species have as sharply limited a development as those of the first. It is even probable that, although some of them may always be of insignificant size, others, under the influence of special, unknown irritative conditions, may be the starting-point of large cysts of the broad ligament, with purely fluid or papillary contents.

II. *Follicular Cysts.*—Hydrops of the Graafian follicle was long considered the only or the chief cause of large ovarian cysts. A few English writers still cling to this theory, which should be entirely abandoned. There are cysts which originate in this manner, but they are always of small size, and, if they cause morbid symptoms, these are due rather to chronic inflammation of the appendages than to the cysts themselves. We might almost say that the operations which they necessitate are castrations rather than ovariotomies. Rokitansky,[51] by his observations, established beyond a doubt the reality of the existence of cystic dilatation of the follicle; many writers give his name to the anatomical lesion which he so ably described.

This follicular cyst or follicular hydrops forms a small, unilocular sac, from the size of a hempseed to that of a walnut.[52] This is Cruveilhier's miniature cyst. But the agglomeration of several of these sacs may, exceptionally, cause the ovary to become as large as one's fist or a fœtal head (Rokitansky, L. Tait). The walls are smooth and covered with one layer of epithelium; the fluid is not thick; sometimes we can find an ovule, even in quite large cavities.[53]

In the newly born, we sometimes find extremely developed follicles near the centre of the ovary; they seem to have some connection with the increased development of the part at the time of birth.[54] But it would be absurd to call these large follicles cysts.

Large multiple follicular cysts, which transform the whole ovary into a *cloisonné* and multilocular mass,[55] constitute a well-defined anatomical type, which corresponds to an equally specialized clinical

variety. It seems to me that we have every reason to distinguish this lesion, which has so unusual a form, from other small-sized cysts, by giving it the name of cystic disease of the ovaries.[56]

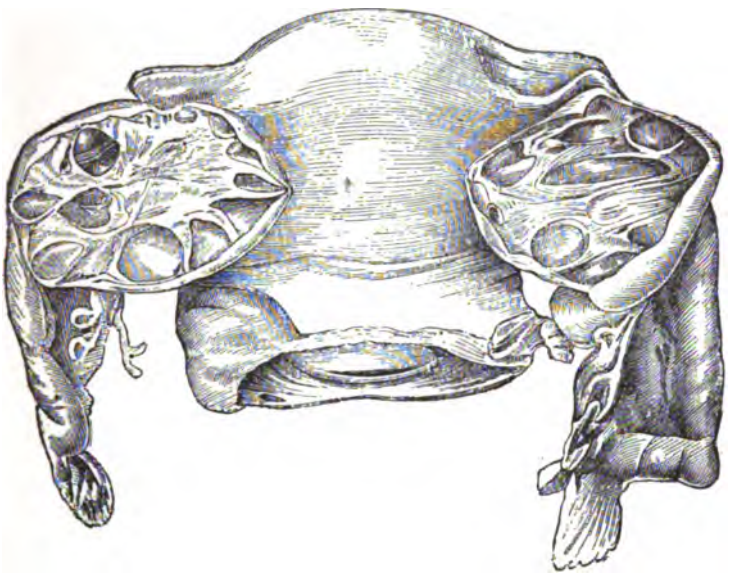

FIG. 32.—CYSTIC DISEASE OF THE OVARIES. Multiple serous follicular cysts. The tumors are seen opened (Barnes).

These multiple cysts, whose size is rarely greater than one's head, and usually about the size of one's fist, are not merely the first stage

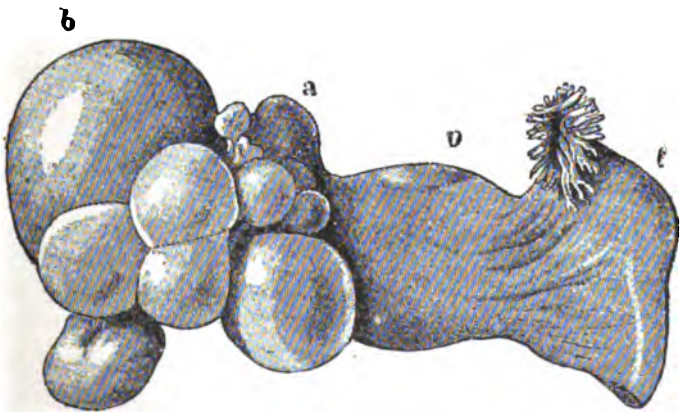

FIG. 33.—CYSTIC DISEASE OF THE OVARIES. (Serous and Myxomatous Multiple Follicular Cysts.) *t*, Tube; *o*, ovary; *a*, *b*, follicular myxomatous cysts.

of growth of a large tumor, as used to be believed; they always remain medium sized, which fact separates them surgically from proligerous glandular cysts, which are also different histologically.

The micro-cystic degeneration which is accompanied by ovarian sclerosis, although possessing a common histogenetic origin in the follicle, forms a type which is anatomically and clinically perfectly distinct from the preceding. The cavities are so small that they do not alter the shape of the ovary nor form any tumor. In this affection, which really belongs under the head of ovaritis, in connection with which I have already described it, we see the whole ovary clothed with cysts about the size of hempseed. Some writers have erroneously considered it to be a phenomenon of physiological development.

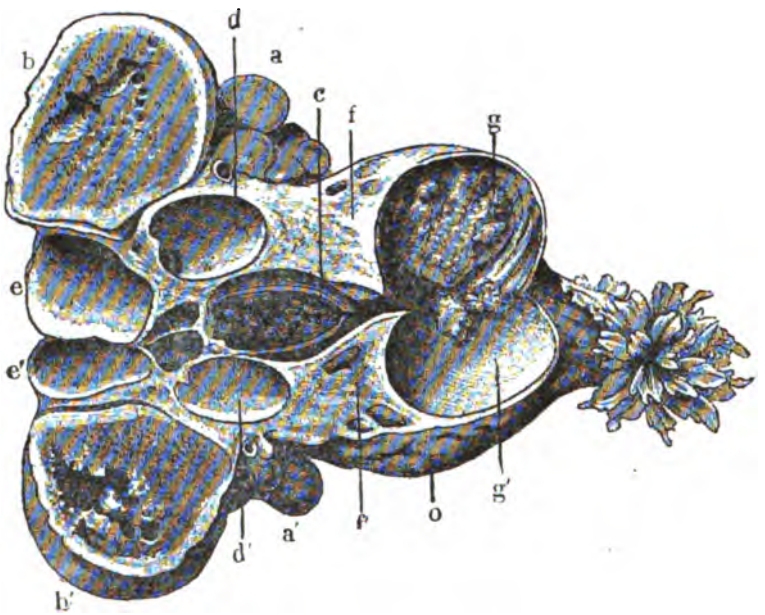

FIG. 34.—CYSTIC DISEASE OF THE OVARIES. (Serous and myxomatous multiple follicular cysts.) (Section of tumor shown in preceding cut natural size.) *a*, *a'*, Small myxomatous cysts; *b*, *b'*, large myxomatous cysts; *e*, *e'*, follicular cysts with fluid contents; *c*, *g*, *g'*, follicular cysts with caseous contents; *o*, *f*, *f'*, ovarian tissue containing small follicular cysts.

In reality, it is a pathological process which is met with only when there is some neighboring source of irritation, as uterine fibroma or inflammation of the tube. The sclerous degeneration of the ovary is only secondary,[57] but it is a constant result of follicular degeneration. It is very marked from the standpoint of macroscopic pathological anatomy, and from the clinical standpoint of cystic disease caused by large multiple follicular cysts.

The contents of the cavities, in cystic disease of the ovaries, is serous or bloody. Yet I once removed a polycystic ovarian tumor in which a certain number of cavities, varying in size from that of the

head of a pin to a walnut, were filled with a serous fluid, while others contained cheesy or lardaceous matter, in which a microscopic examination (made by Toupet in Professor Cornil's laboratory) showed the presence of myxomatous tissue. The lesion was unilateral; the other ovary was sclero-cystic. I think this was a form of secondary degeneration of follicular cysts which has never before been described (Figs. 33, 34, 35).

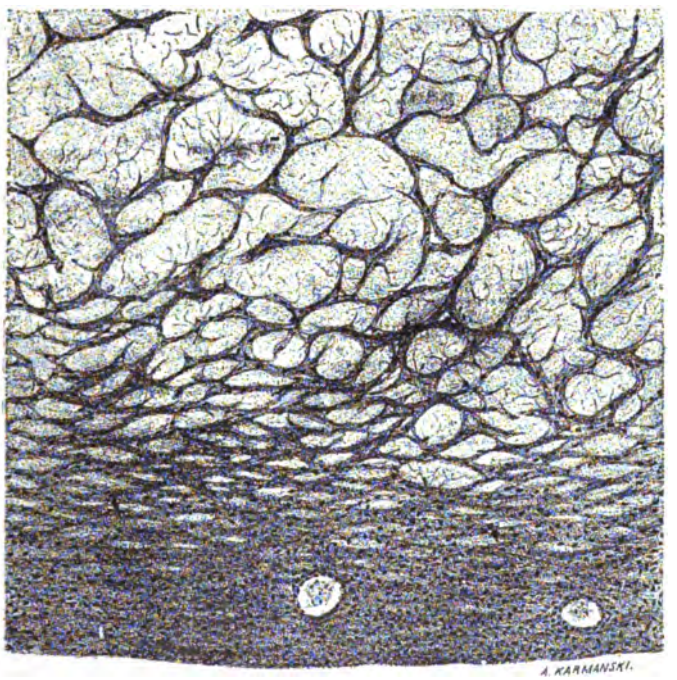

FIG. 35.—FOLLICULAR CYST OF THE OVARY, WITH MYXOMATOUS DEGENERATION. (Magnified 50 diameters.) *A, A*, Loose myxomatous tissue toward the interior of the cyst; *B, B*, dense myxomatous tissue toward the external surface.

III. *Cysts of the Corpus Luteum.*—It is to Rokitansky [58] again that we owe the first description of this cyst. He believed that the corpus luteum of pregnancy alone could be transformed into a cyst; this opinion was too positive: Gottschalk [59] found them in a nullipara. As a usual thing, they are no larger than a walnut, but some cases have been reported where their size was much greater. Of the two described by Gottschalk, one was as large as an orange and the other as a small apple. Schröder [60] has seen them the size of a pigeon's egg. Nagel has seen them as large as an apple, and even as an adult's head.

A microscopic examination of the walls will show the bud-like papillæ characteristic of the corpus luteum. This will prevent confusion of cysts of the corpus luteum with follicular cysts whose walls are thickened and colored by deposits of blood, or even with suppurative ovaritis with inspissated pus, when these cysts are apt to become inflamed under the influence of an accompanying salpingitis.[61]

To understand the genesis of cysts at the expense of what is usually considered to be a cicatricial process, we must remember that the idea of a retraction of the tissues in the formation of the corpus luteum is erroneous, and must be replaced by the idea of proliferation

FIG. 36.—CYST OF THE CORPUS LUTEUM. (Natural size.) (Nagel.)

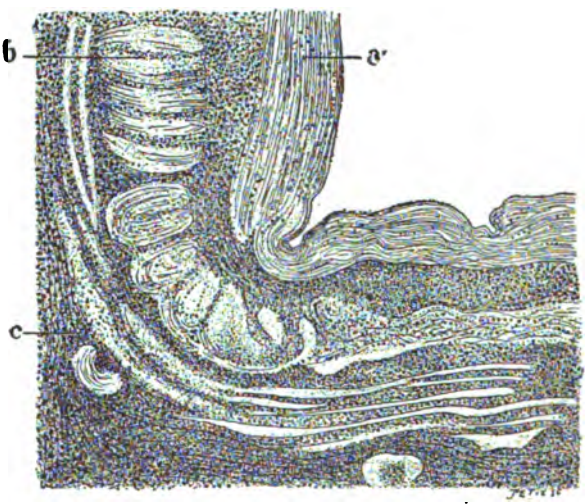

FIG. 37.—CYST OF THE CORPUS LUTEUM. (Magnified 50 diameters.) (Nagel.) *a*, Connective tissue of the internal surface, epithelium removed; *b*, yellow layer of the *corpus luteum*; *c*, normal tissue of the ovary, near the hilum.

and neoformation of ovarian tissue (Call and Exner).[62] The new theory proposed by Toupet[63] would even include the formation of the corpora lutea under the general law of tissue development, attributing their formation to a process identical with that observed upon mucous membranes when they are developing or when they are inflamed.

IV. *Tubo-ovarian Cysts.*—I will give here a few details regarding a variety of cyst which deserves classification because of a morphological peculiarity due to its acquired connection with the tubes. In these cases the cystic ovary is grafted on to the dilated tube with which it communicates, so that the cystic cavity, which is bent like a retort, has both a tubal and an ovarian portion. Richard[64] was the first to give a good description of this anatomical variety of cyst.

Usually small ovarian tumors (cysts of the Graafian follicles) are the ones which are thus adherent to the ovary, and their volume is not very great. But Hildebrandt and Olshausen have seen tubo-ovarian cysts formed by proliferous cysts, and of great size, and two other cases reported by the latter seem to be connected with cysts of the broad ligament.[65] This variety, then, may be superadded, as it were, to every kind of cyst.

The Fallopian tube usually remains permeable, and consequently the fluid overflows into the uterus if there is much pressure. Profluent ovarian hydrops is thus formed, which may be compared to that described under hydro-salpinx by the name of profluent tubal hydrops. This communication answers as a safety valve preventing the overdistention and growth of the cyst. In one case, Hennig ascertained that the tumors, which were bilateral, collapsed after each evacuation. As to the genesis of these compound cysts, the question

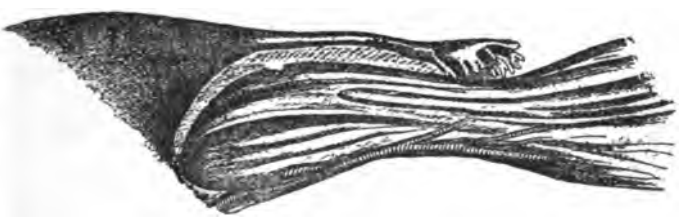

FIG. 38.—PEDICLE OF AN OVARIAN CYST. The pedicle is short: The folds of the tube have not been entirely obliterated. (The cyst has been evacuated.)

is whether the adhesion of the tube to the ovary precedes or follows the formation of the cyst; whether in the beginning the adhesion of the appendages is not caused by their inflammation or whether there is previous and simultaneous existence of hydro-salpinx and ovarian cyst, which become united and fused together by absorption of the wall of separation. This seems to me to be the probable method, so that this lesion might as well be described in the chapter on pathological affections of the tube, as on those of the ovary.[66]

Out of three hundred ovariotomies, Olshausen found three cases of tubo-ovarian cyst, one of which was bilateral.

The Pedicle.—Whatever the origin of ovarian cysts, one important morphological distinction presides over their surgical history. This is the presence, the disposition of, or the absence of a pedicle. It is sometimes very thin, almost membranous, and the tube is separated from it by the free peritoneal fold of the ovary (Fig. 38). This mesovarium aileron is often unfolded, and the tube, which is dragged upon by the

tumor, adheres to it and is somewhat lengthened in consequence. The pedicle then contains two parallel cords—the tube and the ovarian ligament. The narrowest part of the pedicle is at the infundibulo-pelvic ligament or the fold of peritoneum going from the pelvic wall to the ovary, through which the vessels go to that organ. The length and thickness of the pedicle vary greatly, and often depend upon the distance which separates the tumor from the edge of the uterus, and upon the thickness of the broad ligament whose muscular fibres are often hypertrophied, connective tissue œdematous, and veins dilated. It is in the vicinity of the pedicle that the cystic walls are the most thickened and that we find the remains of the ovary.

Certain cysts originating within the broad ligament (dermoid and parovarian) may exceptionally possess pedicles, which are formed

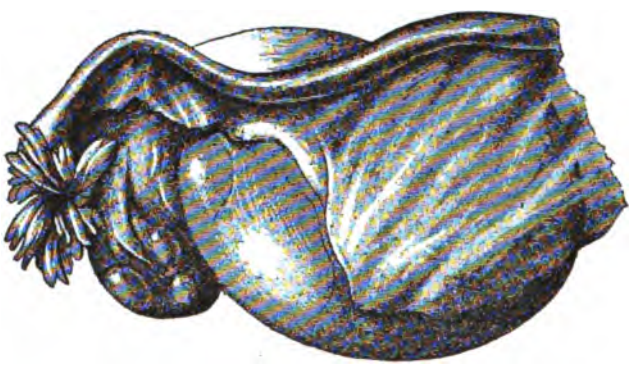

FIG. 39.—MULTIPLE FOLLICULAR CYSTS (CYSTIC DISEASE OF THE OVARY) WITHIN THE BROAD LIGAMENT.

simply by distention and displacement of the peritoneum; they are large, laminated, and membranous.

When there is no pedicle, the cyst is either wholly or in part within the broad ligament. This is the usual situation of parovarian cysts, hyaline or papillary, of some dermoid cysts, and of some proliferous, glandular, or papillary ovarian cysts, to account for which circumstance Freund believes in a congenital malformation consisting in impaction of the ovary. Small follicular cysts and cysts of the corpus luteum may exceptionally be within the broad ligament, where I have myself observed them (Fig. 39). The classification of cysts within the broad ligament is necessarily an artificial distinction; it is of interest from a surgical point of view, but is of no value as a nosological classification. It is a mistake for surgeons to use this term as a synonym for parovarian cysts, or even for the most frequently occurring parovarian cyst, the one with thin walls and

hyaline fluid contents. In point of fact, all of the following varieties of cyst may be situated within the folds of the broad ligament:

1. *Large Cysts.*—A. Parovarian hyaline and papillary cysts (always in this situation, at least in the beginning).

B. Proligerous ovarian cysts, papillary and glandular (rarely).

C. Dermoid cysts, ovarian (often) or parovarian (seldom).

2. *Medium-sized Cysts.*—A. Follicular cysts (rarely).

B. Cysts of the corpus luteum (seldom).

C. Residuary cysts of Rosenmüller's organ (always).

The enclosed cyst may be on the external side of the ligament near the pelvis, or on the internal side and adhere to the uterus, or it may fill up the whole of the ligament, throwing it upward and outward from the opposite side. A segment of the tumor may project beyond the broad ligament toward the abdominal cavity, forming a free additional cyst to the enclosed cyst, from which it is separated by a groove.

According to Terrillon,[67] secondary impaction of proliferous cysts differs from the primary impaction of parovarian cysts. In the first case, the enclosed portion of the cyst forms such intimate adhesions to neighboring tissues that we might add a second vascular pedicle to the primary utero-ovarian vascular pedicle; it comes from the horn of the uterus and is due to dilatation of the normal anastomosis between the superior branch of the uterine artery and the termination of the utero-ovarian vessel;[68] the result is a purplish appearance and a thickening of the broad ligament which do not exist with parovarian cysts. It seems to me that such a distinction is fallacious, and based upon observations of hyaline parovarian cysts alone. The remarkable tendency of some parovarian cysts to invade neighboring parts and to adhere to the uterus is well known.

It is important to distinguish another variety of sessile cysts—those which do not remain within the broad ligament, but go beyond it and travel beneath the peritoneum in the cellular interstices, quite a distance from their point of origin. These might appropriately be called retro-peritoneal cysts.

Any kind of cyst may travel in this fashion; it has especially been noticed in hyaline or papillary parovarian cysts, but also in dermoid cysts and glandular ovarian cysts. On the left side, the tumor may stretch the iliac meso-colon and come in contact with the ilium. I enucleated a hyaline parovarian cyst which had followed this course. On the right side, the cyst may go as far as the cæcum, or even pass beyond it within the mesentery, to the kidney,[69] liver,[70]

and diaphragm.[71] Posteriorly, the cul-de-sac of Douglas may be lifted up, and the cysts lodge between the rectum and uterus.[72]

Anteriorly, the vesico-uterine cul-de-sac is sometimes displaced upward; the bladder, pulled upon by it and the urachus, is enormously elongated, and liable to be wounded by the knife of the operator. Laterally, the cystic masses glide under the peritoneum, be-

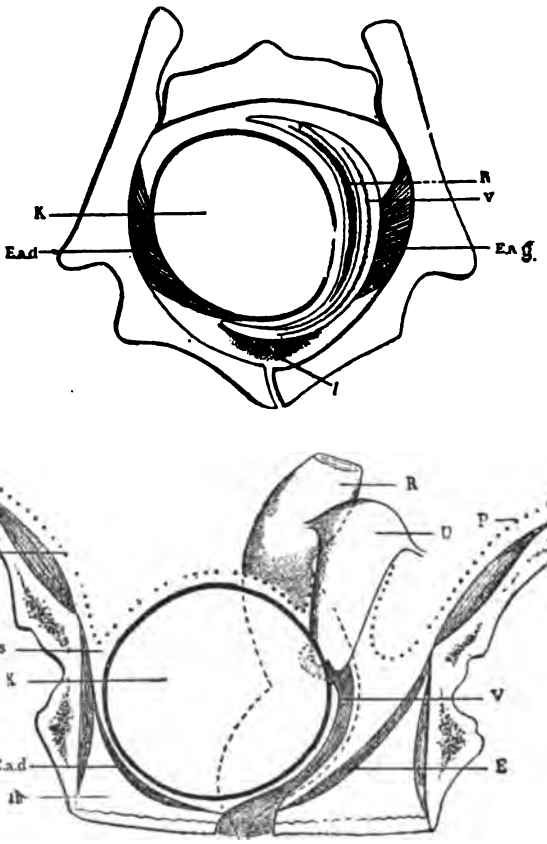

FIG. 41.—RETRO-PERITONEAL DERMOID CYSTS (SÄNGER). The tumor, which is the size of a fœtal head, occupies the superior pelvi-rectal space behind and to the right of the rectum. *K*, Cyst; *U*, uterus; *R*, rectum; *V*, vagina; *P*, peritoneum; *Ead*, right levator ani; *Eag*, left levator ani; *Ir*, ischio-rectal fossa; *Ur*, urethra.

tween it and the pelvic aponeurosis or even into the iliac fossa, press upon the ureter, and are often the cause of renal disease. The papillary and glandular cysts of an areolar or gelatinous variety are the ones which give rise to the most extended and most serious cases of retro-peritoneal migration; contrary to the hyaline parovarian cyst, they form adhesions to neighboring parts and are difficult and often

impossible to enucleate. Dermoid cysts have been found in the retro-peritoneal pelvic cellular tissue.[73]

The mistake has often been made of supposing that they originated from the walls of the bladder, rectum, or uterus to which they were adherent. They have sometimes formed an obstacle to delivery.

Adhesions.—During the first stages of cystic development, the columnar epithelium which covers them is an efficient protection against the formation of adhesions (Waldeyer). After it desquamates, however, adhesions may result from friction and external irritation. Loose in the beginning, these adhesions become closer and closer as time goes on. The anterior surface of a cyst is sometimes so closely glued to the peritoneum that operators have detached the latter from the abdominal walls under the supposition that they were detaching the cyst. The mesenteric attachments may be so extensive and so rich in blood-vessels as to furnish the chief elements of nutrition to the cyst. In a case of this kind, I found it more convenient to begin the ovariotomy by cutting the pedicle, which was relatively slender, and then to successively tie the various adhesions by turning the cyst from below upward. The intestines also may be so closely adherent that it is impossible to dissect out the cyst, and one is obliged to split (*entamer*) the cyst to remove it. Adhesions to the pelvic walls are serious because of the danger of lacerating the ureter or a large blood-vessel and it is sometimes impossible to destroy them if they are very extensive. In the latter case we usually have to do with direct adhesions of retro-peritoneal cysts, without any intervening serous membrane.

Ascites.—The presence of a small amount of fluid in the peritoneal cavity is not unusual, but a large accumulation is rare. Terrier[74] seems to have had an exceptional experience in finding 10 cases of abundant and 25 cases of slight ascites out of 100 cases of ovariotomy. Out of 68 cases of ovariotomy, Terrillon[75] only once found this complication.

In the majority of instances where there is ascites, we have to do with papillary cysts with vegetative growths outside of the cavity, sometimes even with metastatic growths upon the neighboring peritoneum. In the case of glandular cysts, there may be partial fatty degeneration of the wall, or even, according to Quénu,[76] rupture of small superficial cysts whose contents irritate the peritoneum. This author, in my opinion, attributes too much weight to the phenomena of osmosis caused by the colloid matter secreted by the vegetations or poured out by small cysts; this explanation is not needed to ac-

count for the ascites produced by the irritation of a pathological fluid. Ascites constitutes a real protection to the peritoneum when the serous membrane has been unable to isolate the irritating body by the production of adhesions. Some have considered the vascular richness of the tumors [77] to be the cause of the ascites; but this factor seems to me to be of small importance, since telangiectatic fibromata may exist without causing ascites. The characters of the ascitic fluid accompanying ovarian cysts often aid in its recognition. It is richer in solids than the ascitic fluid of cirrhosis (according to Méhu [78] two to two and one-quarter ounces instead of six drachms) and often contains characteristic cellular elements (Quénu). It may be yellowish (*citrin*) or tinged with blood, the latter characteristic seemingly corresponding to a greater degree of malignity of the tumor.

Intra-cystic Apoplexy.—Small hemorrhages frequently occur within the cyst, giving a dark and even chocolate colored appearance to the fluid. Hemorrhages so serious as to threaten life have even been observed; the cyst is then found to be distended with clots, and it may be impossible to find the point of rupture of the vessels.[79] Elongation and torsion of the pedicle predispose to hemorrhage.

Inflammation.—A cystic cavity may suppurate after it has been punctured for purposes of evacuation or exploration, the introduction of pathogenic germs being the cause of the process. To this cause also must be attributed so-called spontaneous inflammations, for the adhesions to the inflamed tubes seem really to permit the introduction of germs.[80]

Suppurative inflammation may follow mortification from torsion of the pedicle. Finally, after parturition, and under the influence of attenuated puerperal septicæmia, suppuration of dermoid cysts has been noticed.

Torsion of the Pedicle.—This accident, though infrequent, is not rare. The cyst may be seen free in the abdomen, quite detached from its former place of insertion, or else held by only a few filaments.[81] When this is the case, we usually have to do with polycystic areolar tumors, or dermoid cysts with thickened walls, having the consistence of solid masses. I have seen an excellent example of this nature. Baumgarten and Hofmeier have seen dermoid cysts that had become quite free from all attachments. If the tumor have not formed any adhesions before its separation, it becomes a foreign body, causing reactionary troubles in the peritoneum and ascites, which might be called acute.

In the contrary event, it may continue to live through its adventitious roots, which in their turn, however, may become the seat of the same troubles.[82] If torsion takes place slowly, in a chronic manner so to speak, it has been known to exercise a beneficial effect, and cause an arrest of development of the neoplasm, without causing any reaction. Fatty degeneration, with partial absorption, is produced; calcification has occurred. But as a usual thing, this progressive torsion is accompanied by acute attacks of peritonitis, and increase in the size of the cyst from hemorrhages. One of the rare results of torsion is gangrenous inflammation of the tumor; to produce it, the torsion must have occurred suddenly and caused mortification of the neoplasm and the intestinal adhesions which serve as a means of ingress to germs.

Intestinal occlusion is one of the possible consequences of torsion.

General Peritoneal Infection—Metastasis.—The metatypical proliferation of the epithelium of glandular cysts, upon which Malassez justly lays so much stress, colloid and carcinomatous new growths, are very similar in character to the atypical malignant neoplasmata; it is therefore not surprising that from some influence yet unknown ovarian cysts should take on the characteristics of malignant tumors, spreading into the peritoneum or even farther, and recurring after removal. These various processes have been included under the somewhat vague, but at this date fully established, name of metastasis.[83] We can divide them into the two following classes:

A. Metastasis from spontaneous infection.

B. Metastasis from infection due to operations.

A. *Metastasis by Spontaneous Infection.*—The cauliflower growths of papillary cysts may remain for a long time within the cyst cavity; but at some given moment, whether from distention and rupture, or simply from erosion and perforation of a limited portion of their wall, these vegetations emerge upon the external surface of the cyst. From that time a new phase in the life of the cyst begins; on one hand, the protective epithelial covering having been broken through, the peritoneum is irritated and ascites produced; on the other hand, the neoplasm which has burst through its boundaries tends to spread, inoculating neighboring parts, in a fashion which has been compared to the contamination by contiguity (*de proche en proche*) by the autoinoculation of mucous patches.

These vegetations are found in great number not only upon the

ovary, tube, and uterus, but upon the intestines, mesentery, parietal peritoneum, and even the walls of the aorta.[84] We may well ask ourselves whether in such cases all operative measures would not be necessarily inefficient, and what would be the course of the secondary growths when the primary tumors were removed. Still, numerous observations show that even under these circumstances a cure may follow; it seems as if the scattered vegetations underwent atrophy or a process of retrogression. In a case reported by Thornton,[85] of bilateral papillary cyst, which burst open and caused a dissemination of vegetative growths upon the peritoneum, a complete cure was established at the end of four years; in another, the patient became pregnant after an operation when the whole of the pelvic peritoneum was covered with papillomata; in a third case, where Thornton was obliged to leave a tumor as large as a walnut in the cul-de-sac of Douglas, at the end of three years this mass was found to have undergone no increase in size. Flaischlen and L. Tait report similar cases.

Metastatic infection of the peritoneum has been very rarely observed in glandular ovarian cysts.[86] It seems to follow spontaneous rupture of the cyst, and we then find in the peritoneal cavity small sacs, with or without accompanying gelatinous masses, grafted upon the epiploön or the intestines, or retro-peritoneal. I recently saw a case of this kind. The tumor was bilateral, polycystic, and there were metastatic growths in Douglas' cul-de-sac, besides a free cyst of the size of an orange which adhered to the intestines and doubtless came from the rupture of one of the ovarian tumors; there was slight ascites; the patient succumbed rapidly. Runge,[87] in a similar case, obtained a complete cure six months later. Cystic growths were scattered upon the epiploön, bladder, and posterior abdominal wall.

Metastasis has been noticed with dermoid cysts. Kolaczek reports an observation of Martin's, in which, during the course of an operation for dermoid cyst with thick, smooth walls, considerable ascites was met with, and several yellowish nodules of the size of peas were scattered upon the peritoneum; several of them contained hair of a light color. Fraenkel, in a case of Billroth's, also saw dermoid growths in the abdomen, associated with a cyst of this nature. There are cases in which the infection is not limited to the peritoneum, but invades the pleura, through the lymphatic vessels, after having infected the inferior surface of the diaphragm. In a case reported by Marchand,[88] the pleural tumors contained a gelatinous substance, and

alveoli lined with columnar epithelium of which some was ciliated. In another case, reported by Terrier,[89] the tumor of the diaphragmatic pleura possessed carcinomatous properties. In fact, these metastatic products of ovarian cysts may take on a malignant histological structure. Thus, a dermoid cyst may become the starting-point of an epithelioma which may invade the uterus, epiploön, duodenum, liver, spleen, and lungs.[90] Degeneration of dermoid cysts into malignant neoplasms, epithelioma, sarcoma, carcinoma,[91] has often been observed.

B. *Metastasis by Infection Following Operation.*—Many cases have been reported where a little while after ovariotomy gelatinous masses have appeared upon the peritoneum (myxoma peritonei), apparently developed from the dissemination of similar substances contained within the cyst. These masses are in the form of vitreous nodules, from the size of a hemp-seed to that of a walnut, disseminated or gathered into a mass which may be as large as a uterus at term. They have the yellow color of barley sugar or are grayish in tint, and delicate partitions of connective tissue, in which blood-vessels may or may not be present, may traverse them as in the vitreous body. Werth has demonstrated that these are not real myxomata, and proposes to call them pseudo-myxomata of the peritoneum.

Is the peritoneum inevitably destined to infection when there is an effusion of the contents of dermoid cysts? Two curious facts observed by Engström[92] show that there may be a perfect recovery, even after the abdominal cavity has been invaded by septic matter. We know, moreover, that, while contamination of the peritoneum by the colloid contents of proligerous cysts is of prognostic import for the success of an operation, yet it does not make that success impossible.[93]

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1. Lawson Tait (The Pathological Importance of the Broad Ligament, Edinburgh Medical Journal, July, 1889) saw upon an enormous intra-ligamental cyst so dense a covering of unstriped muscular tissue that it looked like a gravid uterus.

2. De Sinéty and Malassez: Sur la Structure, l'Origine et le Développement des Kystes de l'Ovaire. Archives de Physiologie, 1878, p. 39 and p. 343; 1879, p. 624; 1880, p. 867; 1881, p. 224.

3. Olshausen: Die Krankheiten der Ovarien, Stuttgart, 1886, p. 64.

4. Quénu: Anatomie Pathol. des Kystes non-dermoides de l'Ovaire. Thèse de Paris, 1881.

5. Coblenz: Die papillären Adenokystomformen. Zeitschr. f. Geb. und Gyn., 1882, Bd. vii., p. 14. Das Ovarial-Papillom in path. anatom. und histogenet. Beziehung. Virchow's Archiv, 1880, p. 268.

6. W. Netzel: Hygiea, Bd. xlix., No. 3, 1887; reviewed in Centr. f. Gyn., No. 23, 1887.

7. Lee: Intraligamentous Ovarian Cystoma with Papillomatous Growths Extending through the Cyst into Fundus Uteri. N. Y. Med. Record, xvii., p. 267.

8. Bauchet: Anatomie Pathol. des Kystes de l'Ovaire. Mém. de l'Acad. de Méd., 1858.

9. Cruveilhier: Anat. Pathol. du Corps Humain, Paris, 1830–1842. Virchow: Das Eierstock-Colloid. Verh. der Ges. f. Geb. in Berlin, 1848, Band iii., page 203. Rokitansky: Ueber die Cyste. Denkschr. der k. Akad. d. W. zu Wien, 1849, i.

10. Mayweg: Die Entwicklungsgeschichte der Cystengesch. des Eierstocks. Thèse de Bonn, 1868.

11. Klebs: Virchow's Archiv, Bd. xli., p. 4, and Handbuch d. pathol. Anatom., Berlin, 1873, page 789. Waldeyer: Die Eierstockskystome. Archiv für Gynäk., Bd. i., p. 252.

12. Slavjansky: Bull. de la Soc. Anat. de Paris, Dec., 1873, and Ann. de Gynéc., Feb., 1874, p. 126. Koster: Jahresbericht, 1873, i.

13. Schröder: Malad. des Org. Gén. de la Femme, French trans., 1886, p. 394.

14. De Sinéty and Malassez: Bull. de la Soc. Anatom., 1876, p. 540. Archives de Physiol., 1878, pp. 39 and 343; 1879, p. 624; 1880, p. 867; 1881, p. 224. There is less difference than might at first be supposed between the theory of these writers, and that of Waldeyer, as proved by this sentence of de Sinéty (Traité Pratique de Gyn., 2d edit., 1884, p. 713): "The formation of these cystic epitheliomata closely resembles what we know in regard to the mode of development of a normal ovary, at the expense of the invaginating epithelium upon its surface. 'We may even ask whether the penetration of the surface epithelium into the ovarian stroma is, from beginning to end, a recent process, or whether it be not the result of some embryonal error in the organ, a latent malformation whose consequences are shown at a later period. It is in accordance with this line of thought that so much stress has been laid upon the persistence of Pflüger's tubes observed in a few cases." Is this not a recognition of the probability of the theory?

15. Malassez: Bulletin de la Soc. Anatomique, 1874.

16. Paul Segond: Encyclopédie Internat. de Chirurgie, French ed., Paris, 1888.

17. Fischel: Arch. f. Gyn., xv., p. 198. The origin of the cells of the membrana granulosa is still a matter of debate. Waldeyer believes in a common origin of these cells and the ova from the germinal epithelium. But, according to His and Kölliker, the cells of the granulosa spring from the hilum, at the expense of the canaliculi of the Wolffian bodies. Consult on this subject, Kölliker: Entwickelungsgeschichte, Leipsic, 1879. His: Untersuch. über das Ei, etc. Zeits. f. Anat. und Entw., Bd. i., 1877.

18. Alban Doran: Clin. and Path. Observ, on Tumors of the Ovary, London, 1884, pp. 61 and 62, figs. 15 and 16.

19. F. Marchand: Beiträge zur Kenntniss der Ovarialtumoren, Halle, 1879. N. Flaischlen: Zur Lehre von der Entwickelung der papillären Kystome oder multilokul. Flimmerepithelkystome des Ovarium. Zeitschr. f. Geb. und Gyn., 1881, vi., p. 231.

20. Olshausen: Loc. cit. (3), p. 85.

21. Paralbumin is precipitated by nitric acid and redissolved by the addition of acetic acid. MacMunn (The Spectroscope in Medicine, London, 1880) has made some spectroscopic researches in this connection which have been so far without result.

22. Oerum: Kemiske Studier over Ovariecystevaedsker, Copenhagen, 1884.

23. Huppert: Ueber den Nachweis des Paralbumins. Prag. med. Wochensch., 1876, No. 17. Hammerstein: Zeitschr. f. physiol. Chemie, vi., Heft 3, and Upsala Läkarefor. Forhandl., xi., 1881. See also Alfred Gonner: Ein Beitrag zur chemischen Diagnose der Ovarial-Flüssigkeiten. Zeitsch. f. Geb. und Gyn., 1884, Bd. x., p. 103. He concludes from conscientiously critical study, that it is as yet impossi-

ble to recognize the fluid of ovarian cysts chemically. Hammerstein's reaction is a valuable indication but not pathognomonic.

24. Quénu: Bull. de la Soc. de Chir., July 25th, 1888, p. 645.

25. Poupinel: Thèse de Paris, 1886.

26. Velitz, of Budapest (Archiv f. path. Anat. und Phys. und klin. Med., Bd. ciii., Heft 3) reports a curious case of dermoid cyst with a mamma. Woman of 40 years who had borne 12 children. Ovariotomy was performed for a dermoid cyst containing oily matter mixed with white hairs; upon the internal wall was found a sort of mamma as large as a child's fist; a little milk resembling colostrum was squeezed out from the nipple. The areola was pink and surrounded by a circle of hairs.

27. Lannelongue: Traité des Kystes Congénitaux, Paris, 1886.

28. P. Ruge: Obstet. and Gyn. Soc. of Berlin, January 10th, 1890. Centr. für Gyn., 1890, p. 99.

29. In the museum of clinical gynæcology at Halle, there is a piece of a dermoid cyst taken from a goose, and containing several feathers.

30. Baumgarten: Virchow's Arch. f. path. Anat., Bd. cvii., 1887, p. 515. The finding of retinal epithelium had already been reported by Marchand: Bresl. ärztl. Zeitschr., 1881, No. 21.

31. Olshausen: Loc. cit. (3).

32. Mahot and Legros: Bull. de la Soc. Anatomique, 1867.

33. Lébert: Traité Prat. d'Anat. Path. Gén. et Spec., Paris, 1857, vol. i., 258. Flaischlen: Zeitschr. f. Geb. und Gyn., Bd. vi., p. 127 (note by Schröder) and Bd. vii., p. 448. Eichwald: Würzb. med. Zeitschr., 1864, p. 422. E. Martin: Berliner klin. Wochenschr., March 4th, 1872, No. 10. Kreis: Correspond. f. schweiz. Aerzte, 1872, No. 100. Holscher: Dissert. Inaug., Göttingen, 1878. Flesch: Verhandl. der phys. med. Gesellsch. in Würzburg, 1872, Bd. iii., p. 111. Spencer Wells: Ovarian and Uterine Tumors, 1882, pp. 41 and 104. Lannelongue and Achard: Loc. cit. (27), pp. 57, 80, 128. G. Poupinel: Des Tumeurs Mixtes de l'Ovaire. Arch. d. Physiologie, vol. xi., p. 394.

34. Poupinel: Thèse de Paris, 1886, note clxiii.

35. The frequency with which purely dermoid cysts are met in certain parts of the head and neck is well known; on the other hand the complex tumors called teratomata are often met with at other points (sacral region, anterior mediastinum, palatine arch).

36. A. Fränkel: Ueber Dermoidcysten der Ovarien, und gleichzeitige Dermoide im Peritoneum. Wiener med. Wochenschr., 1883, No. 28 et seq.

37. Olshausen: Loco citato (3), p. 404.

38. Lannelongue and Achard: Loco citato 27, p. 128.

38. Follin: Thèse de Paris, 1850. Verneuil: Récherches sur les Kystes de l'Organe de Wolff. Mémoires de la Soc. de Chir., vol. iv.

40. Alban Doran: Loco citato (18), p. 49, fig. 10.

41. Mangin: Aperçu de l'État des Kyste para-ovariques à propos d'un Kyste Séreux du Ligament Large. Nouv. Arch. d'Obst. et de Gyn., June 25th, 1888.

42. De Sinéty: Traité Prat. de Gynéc., 2d edit., 1884, p. 866.

43. When speaking later on of small-sized cysts which are of little interest surgically, I will point out some cystic formations which beyond doubt spring directly from the Wolffian bodies.

44. Lawson Tait: Edinburgh Med. Journal, July, August, 1889.

45. Spiegelberg is said by De Sinéty to have found paralbumin (loc. cit., p. 810); but in that case was it not a papillary cyst of the broad ligament? It would be well to indicate this species of cyst, anatomically and clinically so well defined, by some more special name than that of parovarian cyst.

46. Alban Doran: Loco citato (18), pp. 51–55. According to Doran, these papil-

lary cysts are the only ones which originate from the parovarium and deserve the name of parovarian cysts, while the cysts without vegetations and with limpid contents originate in the broad ligament independently of any embryonal remains. Fischel (Ueber Parovarialcysten und parovarielle Kystome. Archiv f. Gynäk., Bd. xv.) notes, after Waldeyer, that the epithelium of the Wolffian body has originally no cilia, hence that in cysts a lining of cubical non-ciliated epithelium may represent an early form of the Wolffian epithelium.

47. Terrillon: Sur une Variété de Kystes Para-ovariens et les Rapports avec les Kystes de l'Ovaire. Bull. de la Soc. de Chir., 1887, July 18th, p. 460. It is easy to see from the cases reported in this article that the cyst described is a papillary parovarian cyst, long before and well described by A. Doran (loc. cit. [18]), etc.

48. Quénu (Revue de Chirurgie, 1890, p. 46) observed a case of this nature, accompanied by ascites which he ascribes to the extreme mobility of the tumor.

49. Lawson Tait: Edinburgh Med. Journal, July, 1889. Sänger: 3d Congress of German Gynäkologists. Centr. f. Gyn., 1889, No. 31.

50. Bland Sutton: Medical Times, Nov. 26th, 1884, p. 728, and Transact. of the Royal Society, London, 1885.

51. Rokitansky: Woch. der Zeitschr. der Ges. der Wiener Aerzte, 1885.

52. Neumann (Hydrops eines Graaf'schen Follikels mit zahlreichen Eiern. Virchow's Archiv, Bd. civ.) describes a multilocular cyst as large as a head, which he believes to be the result of follicular hydrops, and from the nature of the epithelial coat, he concludes that this cyst must have contained several thousand ova. For a review of this article and of the whole subject of hydrops folliculi, see Nagel: Beiträge zur Anatomie gesunder und kranker Ovarien. Arch. f. Gynäk., 1887, Bd. xxi., Heft 3.

53. Ritchie and Webb: Contrib. to Assist the Study of Ovar. Phys. and Path., London, 1865, Bd. xxxi., p. 327, 1887.

54. De Sinéty: Récherches sur l'Ovaire du Fœtus et de l'Enfant Nouveau-né. Archives de Physiologie, 1875.

55. Waldeyer: Die Eierstockskystome. Arch. f. Gyn., Bd. i., p. 252.

56. S. Pozzi: Annales de Gynécologie, April, 1890.

57. Bulius: Die kleincystische Degeneration des Eierstocks. 3d Congress of German Gynäkologists, Freiburg, 1889. Centr. f. Gyn., 1889, No. 32.

58. V. Rokitansky: Ueber Abnormitäten des Corpus Luteum. Allg. Wiener Medicin-Zeitung, Nos. 34 and 35, 1859. Consult also Ritchie: Loc. cit. Slavjansky: Zur normalen und pathol. Histologie des Graaf'schen Bläschens. Virchow's Arch., Bd. 41. Nagel: Loc. cit. (52).

59. Gottschalk: Obst. and Gyn. Soc. of Berlin, Nov. 22d, 1889. Centr. f. Gyn., 1890, p. 12.

60. Schröder: Loc. cit. (13), p. 395.

61. A case of suppurative ovaritis reported by Quénu (Bull. de la Société de Chir., 1888, p. 416) might relate to an inflamed cyst of the corpus luteum.

62. Call and Exner: Zur Kenntniss der Graaf'schen Follikel und des Corpus Luteum bei Kaninchen. Sitzungsberichte der Wiener Akademie, Bd. lxxi., April 15th, 1865.

63. J. Luquet: Contrib. à l'Étude des Corps Jaunes. Thèse de Paris, No. 277, 1888, p. 35. This theory, while agreeing with that of Waldeyer in attributing the formation of the corpus luteum to the membrana granulosa, differs from it in considering the vitelline membrane to be formed of connective tissue, or, at least, in supposing that there is a fibrous layer next to it, which gives support to the cells of the granular membrane. This fact granted, the following is the explanation of the formation of the corpus luteum: when the follicle is ruptured, the granulosa and subjacent connective-tissue layer remain in place, the germinal vesicle and vitellus alone being expelled; both external and internal layers of connective tissue

begin to proliferate by the formation of papillary prolongations which penetrate in between the cells of the granulosa, some going toward the centre, and some to the periphery.

64. Réchard: Mémoires de la Soc. de Chirurg., iii., p. 121, 1853. Bull. Général de Thérap., vol. lii., p. 152, 1857. Bull. de l'Acad. de Méd., vol. xxi., p. 356, 1856. Consult also Labbé: Bull. de la Société Anatom., May, 1857. Rokitansky: Allg. Wien. Med. Zeitung, 1859, No. 35. Hennig: Monatschr. f. Geb., xx., p. 128, 1862. Hildebrandt: Die neue gynäk. Universitätsklinik zu Königsberg, Leipsic, 1875, p. 109. H. Burnier: Zeitsch. f. Geb. und Gynäk., v., p. 357, 1880, and vi., p. 90, 1881. Wachsmuth: Dissert. Inaug., Halle, 1885. Thornton: Trans. of the Obstet. Soc., London, xxi., p. 119. Terrillon: Progrès Méd., 1888, No. 49.

65. Olshausen: Loc. cit. (3), p. 59.

66. See on this subject, Doran: Specimens Illustrating the Development of Tubo-ovarian Cysts as a Result of Inflammation of the Uterine Appendages. British Medical Journal, 1887, p. 781. Griffith: Tubo-ovarian Cysts. Trans. Obst. Soc., London, July 1st, 1887, in British Med. Jour., 1887, p. 1,277. Elliot: A Case of Chronic Salpingitis; Tubo-ovarian Cysts Acutely Inflamed, Hemorrhage into the Cys ; Operation; Recovery. Amer. Jour. of Obstet., 1887, p. 141.

67. Terrillon: Rapports entre les Kystes de l'Ovaire et le Ligament Large. Revue de Chirurgie, 1884, p. 111.

68. Pierre Debet: Kyste de l'Ovaire Inclus dans le Ligament Large. Bull. de la Soc. Anatomique, April 27th, 1888.

69. Zweifel (Obst. Soc. of Leipsic, Oct. 17th, 1887, in Centr. f. Gyn., 1888, p. 439) operated upon a retro-peritoneal dermoid cyst which had burrowed like a mole behind the serous membrane, and gone up to the pancreas. The displaced left kidney had to be extirpated; a cure followed. Zweifel quotes an analogous case reported by Bardenheuer (Der extraperitoneale Exploralivschnitt, Stuttgart, 1887), where a similar tumor was removed by a lumbar incision. The patient died within fifteen hours.

70. Bassini: Actes de la 5me Réunion des Chirurg. Italiens à Naples, 1888.

71. Heurtaux: Gaz. des Hôpit., August 20th, 1889.

72. Wilhelm Hager: Centr. f. Gyn., 1880, No. 1. This case was one of proligerous ovarian cyst.

73. Sänger: Centr. f. Gyn., 1889, No. 31. This cyst was enucleated by perineotomy. In a later work, Sänger (Ueber Dermoidcysten des Beckenbindegewebes, etc.; Arch. f. Gyn., 1890, Bd. xxxvii., Heft 1) collected statistics of 11 cases of dermoid cyst of the pelvic cellular tissue.

74. Terrier: 1st, 2d, 3d, and 4th series of 25 ovariotomies. Revue de Chirurgie, 1882, 1884, 1885, 1886.

75. Terrillon: Bull. de la Soc. de Chir., 1884, p. 659 and 1886, p. 904.

76. Quénu: Revue de Chirurgie, April 10th, 1886, vol. vi., p. 265.

77. Gundelach: De l'Ascite Symptom. des Tum. Ovariques. Thèse de Paris, No. 172, 1887.

78. Méhu: Étude sur les Liquides Pathol. de la Cavité Périton. Archiv de Méd., Nov. 9th, 1877, vol. ii., p. 513.

79. Parry: Amer. Journal of Obstet., Nov., 1871. Rosenberger: Berliner klin. Wochenschr., 1880, p. 271. P. Segond: Encycl. Intern. de Chir., vol. vii., p. 630.

80. Weil (Prager med. Wochenschr., 1878, p. 43) reports a case of suppuration of a cyst which defies all explanation.

81. Heurtaux (Bull. et Mém. de la Société de Chirurgie, 1886, vol. xii., p. 747) believes that in some cases rupture of the pedicle may occur simply from its elongation without torsion.

92. Chalot: Kyste Transplanté; Accidents du Nouveau Pédicule. Annales de Gynécologie, 1887, p. 161.

83. Consult on this subject, W. L. Atlee: General and Diff. Diagnosis, etc., p. 372. Beinlich: Charité-Annalen, Bd. i., 1874. Mennig: Dissert. Inaug., Kiel, 1880. Werth: Pseudo-myxoma Peritonei. Arch. f. Gyn., Bd. xxiv., Heft 1. Thornton: Medical Times, February 19th, 1881. Netzel: Centr. f. Gyn., No. 6, 1883, and No. 6, 1884. G. Mayer: Charité Annalen, vii., 417, 1882. John William: Obst. Trans., London, xxiv., p. 93, 1882. A. Frankel: Wiener med. Wochensch., xxxiii., Nos. 28 to 30, 1883. Kolaczek: Virchow's Archiv, Bd. lxxv., p. 399. Moore: Transact. of Pathol. Society, London, vol. xviii., p. 190. Olshausen: Zeitschr. f. Geb. und Gyn., Bd. xi., 1885. Marchand: Beiträge z. Kenntniss der Ovarialtumoren, p. 9. Baumgarten: Virchow's Archiv, xcvii., p. 1. Schlegtendal: Centr. f. Gyn., 1885, No. 38. Poupinel: De la Généralisation des Kystes et Tumeurs Épithéliales de l'Ovaire. Thèse de Paris, 1886, and Archives de Physiologie, vol. 9, p. 429. Freund: Ueber Häufigkeit und Behandlung der bösartigen Eierstocksgeschwülste. 61. Versammlung deutsch. Naturforscher in Köln, 1888. Teichmann: Ueber maligne Ovarialtumoren. Dissert. Inaug., Jena, 1888. A. Hadjès: Contribution à l'Étude de la Généralisation des Epithéliomes Mucoides Kystiques de l'Ovaire. Thèse de Paris, 1889.

84. Friedrich: Ueber metastatische proliferirende Papillome der Aortenwand bei primären prolif. Kystomen des Ovarium, Kiel, 1888.

85. Thornton: Loc. cit. (83). Flaischlen: Berlin. klin. Woch., 1882, p. 92. Lawson Tait (Phila. Med. Times, 1884, vol. xv., p. 1) quoted by Gundelach: De l'Ascite Symptomatique des Tumeurs Ovariques. Thèse de Paris, 1887.

86. Observations by Baumgarten and Schlegtendal: Loc. cit. (83).

87. Runge: Fall von glandulären Ovarialcystomen mit gelatinosem Inhalt und peritonealen Metastasen. Centr. f. Gyn., 1888, No. 15.

88. Marchand: Beiträge zur Kenntniss der Ovarialtumoren, p. 9.

89. Poupinel: De la Généralisation des Kystes et Tumeurs Epithéliales de l'Ovaire. Thèse de Paris, 1886, p. 154.

90. Babinski: Bull. de la Soc. Anat. de Paris, May, 1883.

91. Olshausen: Loc. cit. (3), p. 401. Krukenberg: Archiv f. Gyn., Bd. xxx., 1887. Pottion: Dissert. Inaug., Jena, 1887.

92. Engström: Ist das Eindringen von Dermoidcysteninhalt in die Bauchhöhle unbedingt schädlich? Centr. f. Gyn., 1885, No. 5.

93. H. Schmid: Ovarialcystenriss, Ovariotomie, Heilung. Centr. f. Gyn., 1887, p. 772. E. Neuber: Pseudomyxoma Peritonei. Dissert. Inaug., Erlangen, 1888. This study is based upon an observation of Frommel's: gelatinous cyst with accumulated masses similar to those within the peritoneum; ovariotomy; recovery. Eight similar cases are reported, with three cures.

CHAPTER VI.

ETIOLOGY, SYMPTOMS, COURSE, AND DIAGNOSIS OF OVARIAN CYSTS.

Etiology.—Cysts of the ovary are most frequently observed during the period of sexual activity. Yet it is undoubtedly true that not only do the germs of many of these tumors date from fœtal life, but that the actual formation of the neoplasm has often begun at that time, to remain latent until it receives some impulse which causes it to develop. This certainly occurs in the case of dermoid cysts, and many observations tend to show that it also occurs with proliferous cysts (mucoid cysts of Malassez, cysto-epitheliomata, glandular and papillary cysts). Doran, Winckel, and De Sinéty have seen in the fœtus or in an infant at term small cystic cavities whose significance and development are as yet unknown. Dermoid cysts may attain such a growth, even in a child, as to necessitate removal. Roehmer[1] successfully performed an ovariotomy for this cause in a child twenty months old, Bell[2] in a girl of thirteen years, Polotebnoff in a child of nine years; on the other hand, some ovarian cysts have developed only at the age of sixty-five or seventy-five.[3] I will return to this subject when speaking of the indications for ovariotomy.

Some curious cases of ovarian cyst have been noted as occurring in the same family; among sisters, for example (Simpson, Rose, Lever, Olshausen).

The affection is often bilateral. Out of one thousand ovariotomies performed by Spencer Wells, it occurred bilaterally eighty-two times (8.2%). The proportion is greater for papillary cysts, Olshausen estimating it at 77%; while for glandular cysts considered by themselves, it would be only 4%.

Scanzoni's view that chlorosis is an etiological factor is purely hypothetical.

Symptoms.—The onset is characterized by vague disturbances which do not differ from those described under the head of uterine symptoms. They are at first simply reflex troubles due to the congestion and stretching of the appendages. Later come pressure symp-

toms of the rectum, bladder, or nerves if the cyst be impacted beneath the peritoneum and unable to move freely in the abdominal cavity. These phenomena are often absent. Following this latent or metritic (pseudo-metritic) period, suddenly appears the period of tumefaction, when the abdomen becomes more or less distended. The general health now begins to be affected, and a period of decline precedes the accidents which will surely cause death unless surgical science interfere.

We distinguish two stages in the development of cystic tumors, each one characterized by well-defined physical signs: First stage: The tumor, which is small, is hidden in the pelvis, and recognized only by bimanual palpation. Second stage: The tumor has become ventral, and may be easily felt through the abdominal walls.

1. *Pelvic Stage.*—Usually, as soon as the tumor has attained twice or thrice the size of a normal ovary, its weight causes it to fall within Douglas' cul-de-sac; still, in some cases where retroversion of the uterus opposes a barrier, it may remain at the side or in front of the uterus. Bimanual palpation will determine its presence, and its situation and connections will show its ovarian nature; it is usually hard, because of the small size and great tension of the capsule, rarely elastic or irregular. Hegar's manœuvre (pulling down the uterus with a tenaculum, and using rectal touch or bimanual palpation) is often of assistance in finding the pedicle. When the tumor has a well-defined pedicle, it is very mobile and can be perceived through the vagina only when pressed upon from above downward. When included in the broad ligament, it seems to be one with the uterus, but careful examination will reveal a slight groove between them; we must not forget that the uterus is pushed to the side or behind, or even to the front. In the case of papillary cysts, the tumor is often bilateral, and we may exceptionally feel upon its surface, through the vaginal cul-de-sac, vegetations which resemble cocks' combs; there is usually some ascites.

In speaking of the pathology, I have already mentioned the existence of a well-defined type of cystic lesions of the ovary, for which I suggested the name of cystic disease. It is characterized by the number of sacs, their small volume, which usually limits the growth of the tumor to the size of a fist or a fœtal head, and by the frequency of their occurrence bilaterally. Owing to their small size, these tumors remain indefinitely in the pelvis; by touch and bimanual palpation we feel them either upon the sides of the uterus or in the cul-de-sac

of Douglas, where they may be fixed by adhesions. One of the most constant symptoms which they cause is menorrhagia. L. Tait[4] incidentally but clearly pointed out this special clinical variety, which he considers to be a result of follicular cysts. He noted the frequency with which it accompanies uterine fibroids, but he also mentions (and I have observed several cases in point) that it occurs independently of other lesions. In the latter event, an exact diagnosis is rarely made, as we are more apt to think there is some tubal affection (hydro-salpinx) or hæmato-salpinx, which is more common and which, it must be confessed, is difficult to differentiate from it.

2. *Abdominal Stage.*—The external characters of the tumor vary greatly when it may be felt at a certain height above the pelvis. If the patient be very fat, or if she be a nullipara with firmly contracted abdominal walls, anæsthesia may be useful to cause relaxation and permit of a careful examination of the relations of the cyst. It is equally useful in the first or pelvic stage of the tumor. By abdominal palpation we feel a spherical tumor well-defined superiorly and laterally, less marked inferiorly; an irregular shape, or protuberances upon the surface, usually indicate a polycystic tumor; the larger the tumor, the more elastic and less resistant does it feel; fluctuation, previously non-appreciable, is often felt after the administration of an anæsthetic. Percussion over the tumor gives dulness; it must be very lightly done, otherwise we will get a sonorous note transmitted from the intestines. This neighboring sonorous body often makes it difficult to outline the cyst with any great exactness by the use of the plessimeter.

By touch and bimanual palpation we usually find the uterus anteverted, just in front of the pubis, and pushed slightly to the opposite side from that of the cyst; the cervix is drawn upward and not easily accessible; it often seems to disappear owing to the stretching of the vaginal culs-de-sac. The sound will show decided elongation of the uterine cavity. Later, as the cyst increases in size, it will push the uterus backward (Peaslee). Finally, there are some cases where the uterus is pushed downward; I had a case of this kind, in which the patient was cured after I had performed ovariotomy with fixation of the pedicle into the abdominal wound. In large cysts of the broad ligament, the uterus may be completely pushed to one side.

If the cyst attains enormous dimensions, the abdominal walls become thin and striated, the linea alba is widened, the umbilicus protrudes. Dilated veins are seen upon the walls, especially in the

region of the iliac fossæ, while in the ascites of cirrhosis they are most prominent in the supra-umbilical region. When the tumor extends beyond the umbilicus, fluctuation is easily felt over the greater part of its area, and is most distinctly felt in thin-walled parovarian cysts. In determining the amount of its repercussion, we get an idea of the size of the sacs, and if there are several centres of fluctuation we may affirm that the tumor is polycystic. Toward the sides we often find solid masses, which feel like a placenta; these are areolar and colloid microcystic conglomerations. Percussion elicits flatness over an irregularly spherical area; convex above, separated by a zone of resonance from the hepatic dulness, unless indeed the great size of the tumor has united the two dull areas. Intestinal tympanitic resonance surrounds the tumor. The resonance of the stomach may be diminished, but may always be found in the epigastrium and on the left side of the thorax. A change of position does not affect the dulness. In extreme cases, the costal cartilages and the xiphoid appendage are bent, the liver becomes horizontal and is pushed into the concavity of the diaphragm, the heart is pushed upward, and the abdomen projects into the thorax. It is no longer cylindrical, but projects anteriorly, and slopes by a gentle curve from the chest, which seems to be merely an appendage to it. Pressure upon the aorta and the crural arteries may cause vascular souffles which are of no importance.

There is one sound which is perceived more by the hand than by the ear, which is like the crepitation of crushed snow. According to Olshausen, it is due to the displacing of colloid matter either in one of the cavities or upon the surface of the cyst if it is ruptured. I think that simple friction of the peritoneum gives the same sensation, and I do not attach much importance to it.

Menstrual disorders are more rare than we should imagine *à priori*. Since large cysts are usually unilateral, the remaining normal ovary maintains a regular condition of the function.

Sterility is an inevitable result only when both ovaries are affected, and we know that ovarian cysts often complicate pregnancy. Gallard[5] studied sixty-nine cases of cysts in order to determine what influence was exerted upon menstruation. Once out of every five cases there was diminution of the flow or delay in its appearance; once out of eight, irregularity, pain, or increase of the flow. We have already mentioned the fact that menorrhagia often occurs in the case of cysts impacted in the immediate neighborhood of the uterus. After the

menopause, cases have been noticed of congestive uterine phenomena causing the reappearance of a more or less irregular flow of blood[6] which leads the patient to believe in a return of the menses. Under the influence of ovarian as well as uterine tumors, there is often a reflex swelling of the breasts with pigmentation of the areola as in pregnancy. A milky secretion has been noticed, even in quite young girls. We must be careful to make a distinction between the pressure phenomena in the early stages, which appear only when the tumor is imprisoned in the pelvis (cysts within the broad ligament, and retro-peritoneal cysts), and the pressure symptoms caused at a more advanced stage by the weight and size of the cyst rather than by its relations.

Pressure upon the bladder often produces incontinence of urine in the early stages of cysts within the broad ligament; and sharp pain from pressure upon the nerves may arise under the same circumstances. Pressure symptoms, as a usual thing, are not marked until the tumor is so large as to distend the abdomen. Then there may be vesical troubles, frequent desire to urinate, from diminished size of the bladder. Constipation is the rule, from pressure upon the rectum and interference with the physiological efforts of defecation. Interference with the normal dilatation of the stomach and with peristalsis of the intestines causes anorexia and vomiting, and contributes to the advent of marasmus. When the tumor reaches very high in the abdomen, the movements of the diaphragm and even of the ribs may be seriously embarrassed, causing painful dyspnœa and cyanosis. Another cause of dyspnœa which is frequently not recognized is the compression of the ureters, causing chronic uræmia. We can scarcely exaggerate the importance of this complication, nor the necessity for careful examination of the urine.[7]

The cardiac affections noted in these cases may, perhaps, be due to the renal disease. I dwelt at length upon this subject in the chapter upon Fibroids, and need not repeat the details in this connection. Varicosities, hemorrhoids, œdema of the extremities, purpura, pendulous belly, need no more than a passing mention.

As soon as the cyst attains a certain size, the columnar epithelium which surrounds and protects it desquamates in places, and then adhesions are produced from friction. They are formed especially upon the anterior wall, which is the one most in contact with a resistant surface, but they may grow in connection with every organ contained within the abdomen. This result of partial peritonitis takes

place quietly and without any febrile symptoms, unless indeed it be caused by torsion or rupture of the cyst, in which case all the signs of a more or less severe inflammation may be manifested.

The general health is rapidly impaired. Two chief factors are concerned in this gradual decline of strength: compression of the various portions of the digestive apparatus, which, joined to the reflex dyspepsia observed in the course of all utero-ovarian diseases, prevents repair of the constant tissue waste; and compression of the ureters, which, though it may not for a long while cause albuminuria, does cause serious uropoietic disturbances, and adds to the malnutrition of the system, long before it is clinically recognized. Pressure upon other organs, causing pain and sleeplessness, act in the same way by adding to the general enfeeblement. The patients become greatly emaciated, but I cannot see that the facies of ovarian disease, so strongly insisted upon by some writers as almost pathognomonic, are specially marked.

Accidents.—Inflammation, Suppuration.—Temporary elevation of temperature and sensitiveness over the abdomen, in women suffering from ovarian cyst, indicate acute inflammation, either around or within the cyst. Suppuration of the cyst itself will cause regularly recurring and intense fever, with chills and sweating, accompanied by intense pain. A slight effort of memory will probably recall the cause of these accidents (contusion, puncture, torsion of the pedicle).

Torsion of the Pedicle.—This accident was first pointed out by Rokitansky.[8] Many studies have since been made of this especial point. Thornton[9] has recently collected the reports, adding the results of his large personal experience. Out of 600 ovariotomies he found torsion of the pedicle 57 times. This accident is less frequent than in Rokitansky's time. It was then about 13%, and is now about 9.5%.[10] This is accounted for by the fact that at the present day cysts are operated upon at a much earlier stage. In the etiology we must mention pregnancy; out of six cases of cyst complicated by pregnancy, upon which Thornton operated, torsion was present five times, and in nine cases the acute symptoms were first manifested after labor or abortion. In four instances there was arrest of menstruation from cold; four followed puncture of the cyst; in eight cases there was no discoverable lesion. Torsion of the pedicle has been produced by exploration of a very movable tumor (Olshausen, Mundé) and by the change of position due to evacuation of the cyst. Any-

thing adding to the mobility of the tumor—as ascites, length and slenderness of the pedicle—is a predisposing cause.[11] Dermoid cysts are especially liable to it, however movable they may be, because of their weight.

Lawson Tait has seen torsion more often upon the right side, Olshausen on the left. Veit, Röhrig, and Thornton have seen it on both sides.

If this torsion is slowly acquired, there may be gradual decrease in the size of the tumor, which is rather a favorable occurrence than an accident. But if it occurs suddenly, sharp pain and signs of peritoneal reaction are at once manifested, and soon followed by peritonitis of varying intensity. It may be rapidly fatal or assume a dropsical character. Meteorism and acute ascites are also developed. Sometimes these accidents disappear in the course of a few days. Olshausen believes that there may be temporary torsions of the pedicle; he has seen two examples of it, which he thinks conclusive. Finally, the febrile symptoms may continue because of an absorption of the products of slow mortification of the tumor (septic intoxication rather than infection), and the patient dies of marasmus and cachexia.[12] Rupture of the cyst often occurs at the same time as torsion of the pedicle; the latter is often complicated by extensive internal hemorrhages, the arterial supply continuing, while the veins are obliterated by the torsion. These hemorrhages add acute anæmia to the grave condition of the patient already existing. Symptoms of a localized peritonitis around the cyst soon declare themselves, so that the formation of extensive adhesions is one of the most frequent results of torsion.

Rupture of the Cyst.—The rupture of small cysts due to follicular dropsy seems to be of frequent occurrence and little importance; it may arise by spontaneous dehiscence.[13]

As to the large cysts, their rupture is due either to traumatism, a blow upon the abdomen, a fall, the strain caused by vomiting,[14] or to wearing away of the wall, or fatty degeneration caused by thrombosis. This accident occurs most frequently in the case of gelatinous cysts, and is often preceded by torsion of the pedicle. Erosion of the sac by papillary growths may be another cause of the rupture.

The perforation occurs into the peritoneal cavity or into some neighboring organ. The former is the more frequent. The fluid may be reabsorbed without causing much reaction, if it be but slightly irritating, as in serous cysts.[15] Out of 127 cases the reports of which were collected by Nepveu,[16] there were 43 recoveries after

the lapse of some time, 21 cases of temporary disappearance, and 63 deaths. Death may be so rapid that it seems due to septic intoxication from absorption of the fluid; or it may be preceded by the symptoms of acute peritonitis.[17]

Rapid disappearance of the tumor, change of form of the abdomen, with the signs of a free collection of fluid in the abdominal cavity, which has to be pushed aside by the hand in order to reach the remains of the cyst, are the pathognomonic symptoms of the accident, often ushered in besides by swooning or sharp pain. If the patient survive, there may be signs later of peritoneal irritation with ascites. In rare cases, the rupture may be latent and accompanied by no symptoms sufficiently marked to attract attention.[18]

This fluid may, moreover, be imprisoned by false membranes, and form a new intra-peritoneal cyst.

Abundant diuresis and diaphoresis have been noticed in cases of intra-peritoneal rupture of ovarian cysts. Anasarca also has been seen. Küstner[19] calls attention to a curious symptom, peptonuria. Rupture into the intestines usually occurs at the rectum or colon; if there have been suppuration of the cyst, relief is experienced at first, but a cure is rare; on the contrary, the intestinal contents are liable to infect the cystic cavity and bring about septic fever.

In a very few cases, the stomach or small intestines have been the seat of evacuation. Severe vomiting was the first sign in a case of perforation of the stomach reported by Portal. Where the intestines are perforated, diarrhœa is the initial symptom. A rupture externally by fraying the abdominal walls below or at the umbilicus has been observed, and is rather favorable than otherwise. Rupture into the vagina or bladder[20] is rare, and is characterized by an evacuation of the fluid through these organs.

Evacuation of these cysts through the tubes after the formation of tubo-ovarian cysts, as mentioned above, might be included under the head of rupture of cysts. The evacuation is usually intermittent.

Internal strangulation may occur during the development of ovarian cysts, from excessive pressure upon the intestines, by their twisting about the pedicle, which is often twisted itself, or finally from peritoneal adhesions becoming attached to the tumor; in the last case diminution in the volume of the cyst by puncture may have a fatal effect.

The occurrence of pleural complications has been so positively asserted that it deserves mention. According to Terrier,[21] these compli-

cations may precede or follow surgical interference, and are by no means exceptional. Demons[22] found them nine times out of fifty cases, and he contradicts the generally held opinion that pleural effusions indicate malignity of the neoplasm. He considers that the impeded lymphatic circulation of the abdomen reacts upon the pleura beyond and through the diaphragm.

Prognosis.—"When ovarian tumors," writes Spencer Wells,[23] "attain such a size that the general health is affected, the length of life granted to the patient will probably not exceed two years, and these two years usually consist of a series of troubles, even of torture and despair. The cases in which expectant treatment and successive punctures have been able to prolong life for several years are great exceptions to the foregoing rule." Yet we should recognize the fact that in some rare cases the course of the disease may be very slow. T. P. Frank speaks of a patient of eighty-eight years who had had a cyst since the age of thirteen. It was in all probability a dermoid cyst. Olshausen observed a cyst, probably of the same nature, in a woman of forty-eight, which had been there for nineteen years. Hyaline parovarian cysts or unilocular cysts of the broad ligament may rupture into the peritoneum several times in succession, with quite a long respite after each rupture. On the other hand, proliferous cysts may, after remaining quiescent for a long time, suddenly take a rapid course. Hyaline parovarian cysts of the broad ligament develop very quickly.[24] After their first appearance, the growth of papillary cysts may be arrested for a considerable period; but the appearance of ascites, showing that there has been a perforation of the sac by vegetations, indicates that a fatal issue is imminent.

An absolute or relative spontaneous cure is not an impossibility. Intra-peritoneal rupture often brings about the cure of parovarian cysts. Gradual torsion of the pedicle may exceptionally cause atrophy of proliferous cysts by diminution of their walls and calcification.

Death is the ordinary result of cystic development unless there be surgical interference. Marasmus, peritonitis, embolus, are the three chief causes of death. Suppuration from repeated puncture or ill-timed treatment used to be frequent. What influence has ascites upon the prognosis? It is without doubt an unfavorable occurrence, since it is met with in papillary cysts when the vegetations have perforated the sac, and in glandular cysts when rupture occurs or when there is torsion of the pedicle. Still, the reports of numerous cases show that this complication is not necessarily fatal, and L. Champion-

nière,[25] who has never seen a case of recovery from ovarian tumor accompanied by ascites, has evidently happened to see a series of unfortunate cases.

Another question which is still shrouded in darkness is that of the benignity or malignity of papillary cysts. Many cases where they have been removed have resulted in a cure. Eleven years ago I operated upon double papilloma[26] of the ovaries, accompanied by ascites, in a young girl, who is now completely restored to health. I mentioned other similar cases when speaking of metastasis. On the other hand, the fact of the frequent occurrence of metastasis or even of generalization of papillary cysts, which assume a malignant type, should make our prognosis very guarded. There is probably some element present which the microscope is unable to reveal. It would seem as if the histological instability of these neoplasms, the ready transformation of their columnar epithelium into metatypical or atypical epithelium, places these cysts in a state of constantly imminent malignity.

Cohn,[27] out of fifty cases of papillary cyst, which were carefully followed after ovariotomy, found twenty which seemed to him to be anatomically malignant, and in fact a microscopic examination will never permit of our asserting that such growths are clinically benign. It is better always to expect the worst, and to be on the lookout for general peritoneal infection. Poupinel[28] also advises this caution.

Glandular cysts may undergo cancerous degeneration. Hofmeier[29] and Cohn[30] have pointed out that a racemose appearance of the cystic masses often indicate malignity. Certain clinical symptoms leave no doubt in such cases; these are: Sudden development of a tumor which has already existed for some time; rapid emaciation and cachexia; multiple adhesions, especially in the pelvis; œdema of the lower limbs and abdominal walls out of proportion to the size of the tumor and the amount of ascites present; pleuritic complications, etc. The prognosis of operation for malignant tumors showing these symptoms is very unfavorable. Still, as cases of permanent cure have been known to follow where it seemed impossible, we should operate wherever there seems to be any chance of success. Leopold,[31] in view of this possible degeneration, makes it a rule to remove any ovarian tumor as soon as it appears, especially if it be bilateral.

Diagnosis.—A. *Pelvic Tumors.*—In the earliest stages of ovarian cysts, it is difficult to distinguish them from other tumors situated by the sides of the uterus. A sessile cyst of the broad ligament might

be simulated by an inflammatory nodule of peri-metro-salpingitis. A remembrance of previous symptoms, the course of the disease, with the existence of inflammation of the tubes and ovaries, will prevent error. These tumors are, moreover, less sharply limited, more sensitive to pressure, and subject to more rapid changes of size. A small pelvic hæmatocele shows fluctuation at first, but does not give the sensation of an encapsulated tumor, especially laterally, where it always spreads out more. Later it becomes hard, while the manner of its appearance, with the intense peritoneal reaction which marks the onset, are very diagnostic. The extra-peritoneal variety may be difficult to distinguish from a beginning cyst of the broad ligament, except by the course of the swelling, which shows a tendency to absorption. Tumors of the tubes, especially hydro-salpinx, may cause perplexity. A bilateral lesion would seem to indicate their presence; oftentimes laparatomy alone, which is indicated in either case, can decide the question. Extra-uterine pregnancy [32] in the beginning has few distinctive symptoms, although it usually causes amenorrhœa and congestion of the genital mucous membrane; later it is characterized by special signs, which will be described in another chapter.

Retroflexion of the gravid uterus at the third and fourth months is to be suspected only when there are signs of beginning pregnancy, and when the tumor is situated in the posterior cul-de-sac and causes acute pressure symptoms (retention of urine, constipation); finally, if it be of solid consistency and continuous with the cervix, which is far forward, attempts at reduction will settle all doubts upon the subject. The exact position of the uterus should always be determined before deciding that there is a tumor independent of this organ. I consider stercoraceous tumors worthy of mere mention only.

B. *Abdominal Tumor.*—Pregnancy [33] deserves the first mention, for a mistake in regard to it would be the most fatal of any. An error is most likely to be committed when there is hydramnios, for then we can neither palpate the fœtus nor hear the fœtal heart sounds.[34] In order to avoid the opposite error—of mistaking a cyst for a gravid uterus—we should never be satisfied with probabilities, but seek for absolutely certain signs; we must remember that amenorrhœa, swelling of the breasts, and even a delusory subjective sensation of fœtal movements (produced by borborygmus) may all exist in a case of ovarian tumor.

The diagnosis will be settled [35] only by a perception of the movements and hearing of the fœtal heart sounds by the surgeon, positive

identification of fœtal parts, sensation of contraction of the gravid uterus (Braxton Hicks), ballottement, and, toward the end of pregnancy, pelvic engagement of fœtal parts. The use of the sound is both dangerous and useless. We must not forget that pregnancy and a cyst may coexist, in which case the surgeon's task becomes complicated; the fluctuating mass and the exact situation of the position of the fœtus should be carefully studied by the aid of auscultation and palpation. The error of thinking that there is a cyst where

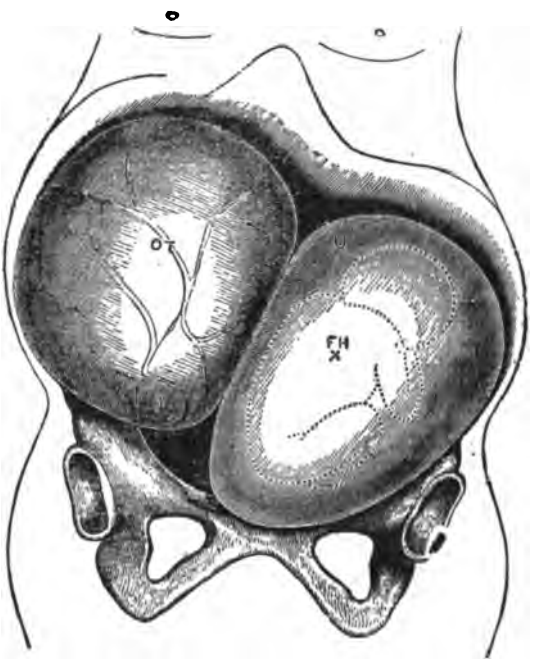

FIG. 41.—OVARIAN CYST COMPLICATED BY PREGNANCY. *O T*, Cyst pushed out of the pelvis by the uterus *V*, which is pushed against the pelvic walls; *F H*, auscultatory centre for the fœtal heart sounds.

pregnancy exists is far more serious than the opposite blunder;[36] and when in doubt we should always await developments. It is unnecessary to say that exploratory puncture is more dangerous than an exploratory incision.[37]

Ascites may simulate a large cyst, which fills the abdomen and is indistinctly outlined. I will recall the signs of effusion of fluid within the peritoneal cavity; the abdomen is more spread out, less acuminated, than in cysts; flatness is found in the dependent portions, and limited superiorly by a concave line (Fig. 42 and Fig. 43). In a position of lateral decubitus, it gravitates to the side and to the iliac

fossæ, while the tympanic note appears upon the opposite side, where it did not previously exist; this displacement of the fluid is very characteristic if we can but find it, as is the fluctuating sensation transmitted from one side of the abdomen to the other. Some cases present greater difficulties of diagnosis, where, for instance the ascites is of rapid development, the abdomen distended, the skin smooth, shining, and striated, non-depressible, giving a sensation of undulation and the returning shock rather than of clear fluctuation. Dulness may not be systematically present in the dependent portions; the contents are irregularly situated and not easily displaced by a

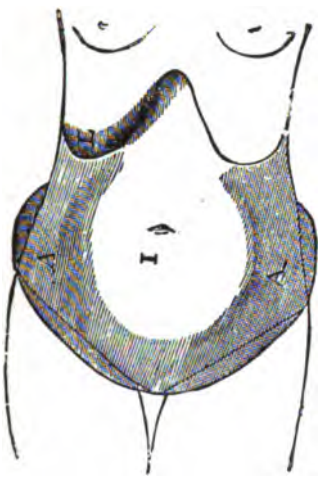

FIG. 42. OUTLINE OF AREA OF DULNESS IN ASCITES. *I*, Intestinal resonance; *L*, hepatic dulness; *AA*, dulness of the flanks.

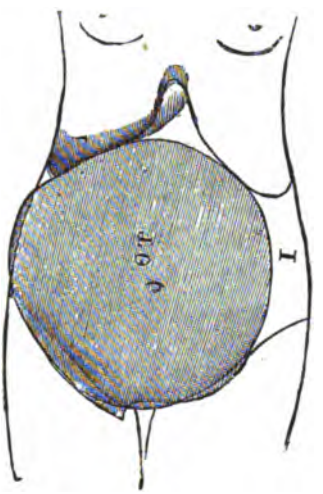

FIG. 43. DULNESS IN A CASE OF OVARIAN CYST. *I*, Intestinal resonance; *L*, hepatic dulness; *OT*, dulness over the cyst.

change of position (Duplay).[88] But the rapid increase in size of the abdomen, œdema of the lower limbs, decline of the general health and the absence of a previously existent tumor are all symptoms that will help the surgeon in making a correct diagnosis. Another sign to be looked for is the mobility of the uterus, which is present in ascites and absent in large cysts. Finally we must examine into the conditions of the viscera (liver, heart), disease of which usually gives rise to ascites.

Difficulties of diagnosis are the greatest in tubercular or cancerous peritonitis; for dropsy of the peritoneum may then be encysted by adhesions. In the first case, signs of intestinal and pulmonary tuberculosis, irregularities in the shape of the abdomen due to meteorism interfered with by adhesions, the *cri intestinal* (Guéneau de Mussy)

caused by palpation, will clear the diagnosis; in the case of cancer we have the presence of irregular masses dependent from the epiploön or adherent to neighboring parts, and rapid cachexia.

Puncture may be of real service in these cases, to allow of an examination of the fluid, and to facilitate palpation of the abdomen, which becomes more flaccid after its use. Yet at the present day we usually omit it, for we have learned its drawbacks. If we decide to perform it, the greatest precautions are to be taken; the trocar and canula are to be purified by flame; instruments of small calibre are to be used for aspiration, the wound carefully closed, and the abdomen immobilized. Puncture with total evacuation of the fluid is less grave with a large tumor than with a small one, for the retraction of the sac prevents effusion of the fluid into the peritoneal cavity. A cyst punctured with Potain's apparatus should be emptied very slowly. We may replace the vacuum by the use of a simple siphon made by attaching to the canula a long rubber tube. The size of the trocar should not be greater than that of the instrument used for hydrocele. The site chosen for the puncture is in the middle of a line going from the linea alba to the anterior superior spine of the ilium, or else the linea alba itself; the bladder is to be evacuated beforehand; we must carefully cleanse the abdominal walls with soap and bichloride, and be sure that the spot to be punctured is absolutely dull on percussion.

An examination of the fluid usually suffices to establish the diagnosis; viscidity and a brown, green, or black color are the characteristics of cystic fluid; a clear fluid non-coagulable by heat comes probably from a parovarian hyaline cyst of the broad ligament or from a hydatid cyst. In some cases examination of the fluid does not settle the question—where, for instance, it is tenacious, yellowish, amber-colored, or tinged with blood: both ascites and some kinds of cyst show these characters. I spoke above of the hopes raised by the discovery of the presence of paralbumin, and of how they had been disappointed.

(Yet the finding of paralbumin points to the probable existence of a cyst. If the liquid spontaneously coagulates, the chances are in favor of ascites—although this sign is not absolutely pathognomonic, any more than the foregoing. Klob, Martin, Westphalen, Scanzoni, Olshausen, have seen spontaneous coagulation in the fluid from an ovarian cyst. A proportion of solids greater than ℥ iij. ʒ ij. to the quart favors the diagnosis of cyst [Méhu, Quénu]. Microscopical examination, to which Spiegelberg and Waldeyer attach great impor-

tance, demonstrates in the ascitic liquid the presence of amœboid cells, pavement epithelium, and blood-corpuscles, but never columnar epithelium, which is often found in glandular cysts; as to papillary cysts, the anatomical elements contained within their fluid contents are usually entirely destroyed.)

Palpation of the abdomen after puncture, which must be cautiously performed, gives valuable information; by it we may recognize the ovarian tumor, and also determine other changes of the viscera which were hidden by the effusion of fluid. We must not forget that ascites may complicate a cyst which has ruptured or a papillary cyst with external vegetations; there will be symptoms of both lesions; we may have a peculiar sensation of ballottement, due to the floating of the cyst in the ascitic fluid, like a piece of ice in water.

Puncture of a cyst done with even the greatest precautions is by no means a harmless operation. Partial evacuation may be followed by an effusion of the fluid into the abdomen, and fatal peritonitis;[39] the neglect of antiseptic precautions or some unknown influence may bring about suppuration of the cyst. This has been noticed particularly in connection with dermoid cysts; I have seen one case, which was followed by cure. Grave hemorrhages have been known to occur from wounding the large blood-vessels of the abdominal walls or of the tumor. Weakening of the cystic walls may result from the puncture and permit the exit therefrom of papillary vegetations, with consequent infection of the peritoneum.[40]

Uterine fibroids have often been simulated by oligocystic tumors with gelatinous contents, which give them the same elastic consistence; this error is especially liable to occur if absence of a pedicle cause these tumors to move by movements imparted to the uterus, as though they formed a part of it. Anæsthesia will often permit the observation of fluctuation, which should be carefully felt for by bimanual palpation, and the connections between the tumor and the uterus accurately identified. Great increase in size of the uterine cavity, shown by the sound, points toward a fibroid; still, an elongation of an inch to an inch and a half may be produced by the ascension of and traction exerted by the ovarian tumor. Fibro-cystic tumors of the uterus are especially apt to cause an error of diagnosis. The first cases of hysterectomy, we remember, were done under the supposition that an ovariotomy was to be performed.[41]

Hæmatometra is recognized by its situation and special etiology.

Vesical distention has been the source of numberless errors, which

may be avoided if the surgeon himself will employ the catheter before examining. In one case, I saw a distended bladder which reached to the epigastrium; I had been called in to puncture this false cyst in a patient suffering from general paralysis. Spencer Wells, Atlee, and Emmet have all reported remarkable cases of this kind.[42]

Renal tumors, hydronephrosis, hydatidiform cysts, etc., have given rise to mistakes. We should ascertain whether the tumor is fixed in the hypochondrium, and free inferiorly, permitting one to pass the hand beneath it quite far above the pubis; also whether the intestines, especially the colon, are interposed between the tumor and the abdominal wall. When the tumor fills the abdomen, these signs will be absent: even then, however, the situation of the colon is of importance (Nélaton). It has been suggested that, in order to make this sign very marked, the tumor should first be partially emptied by puncture, and then effervescent enemata be administered in order to distend the large intestines with gas (Simon). Pawlik[43] attaches great value to the persistence in the kidney of its characteristic shape, which can be felt after puncture. The development of a tumor dating from infancy points toward hydronephrosis and cancer of the kidney. Pus and blood are to be looked for in the urine. The exploration of the kidney region by the introduction of the whole hand into the rectum has sometimes furnished valuable information (Fraenkel), but may cause injury to the patient unless the surgeon's hand be exceptionally small and flexible. Examination of the fluid obtained by puncture sometimes settles all doubts, but may only increase them if the liquid be not very characteristic. Urea may be absent in hydronephrosis and present in ovarian cyst; the same may be said of uric acid: still, a large proportion of these products would decidedly point toward renal disease. Finally, sounding the ureters by means of Pawlik's or Simon's method should not be neglected as a last resort.

I will simply mention tumors of the liver and spleen (cyst, hypertrophy), as they are very rare; the diagnosis, when difficult, can be made only by a careful consideration of the relations, sometimes by exploratory incision. Tumors of the mesentery[44] and of the omentum (cysts, lipomata) and echinococcus of the abdominal cavity[45] are usually recognized by puncture or exploratory incision; the latter is to be preferred.

Tumors of the abdominal wall sometimes cause errors, which could be avoided by the use of anæsthetics.[46]

Pseudo-cysts, phantom tumors, tympanites associated with partial contraction of the abdominal muscles and superabundance of fat in any particular spot, sometimes cause the most extraordinary and unheard-of errors, especially in hysterical patients. Oftentimes the abdomen has been opened in such cases, more often still one has been upon the point of doing so.[47] In a case of Krukenberg's,[48] lordosis caused the error. An exceptional case is that of Reeves Jackson,[49] in which puncture and then laparatomy were performed under the supposition that there was a cyst, when it was a case of enormous dilatation of the stomach; they went so far as to incise the viscus. The patient died.

The best way to avoid error in doubtful cases is first to anæsthetize the patient and then carefully to palpate and percuss.

Exploratory Incision.—In the event of failure of all other methods of diagnosis, shall we open the abdomen to ascertain the nature of the tumor and operate, if possible, at the same time? Upon this point Lawson Tait[50] has a positive system; he always prefers incision to exploratory puncture; out of ninety-four such cases he had but two deaths. He makes a very small incision, large enough for the introduction of two or three fingers only and this undoubtedly accounts for the exceptionally good results obtained. Terrillon,[51] in a more extended abstract of cases from many sources, found twenty-one deaths in a hundred, which seems to me too high a rate, in consideration of the great progress made in technique of late. We must remember that under the name of exploratory incision, used for the sake of euphemism, have been included many unfinished operations which were undertaken with great deliberation.

Now, it is not so long since mere incision of the abdomen was considered a very grave step; once done, operators were not content to close the wound without an attempt at extirpations, even under conditions before which we should hesitate at the present day; the statistics, while correct, may lead us to take too dark a view. For my part, I am a decided advocate of exploratory incision, when it seems to be the only method of establishing the diagnosis.

Diagnosis of the Variety of Cyst.—The previous considerations may aid in deciding this point; I will simply give a *résumé* of the principal points.

A large and nodular tumor, with irregularities in the consistence of the nodules, is a glandular cyst. The presence of ascites (if there be no symptoms of rupture), irregular and papillary masses in the

cul-de-sac of Douglas, and the presence of a tumor upon both sides point to a papillary cyst. Easily appreciated and superficial fluctuation throughout the whole extent of the tumor, slow course of the disease, an almost perfect general condition, even when the tumor is large, intimate connection between the tumor and the uterus, whether the cyst appear to be within the broad ligament or attached to a short pedicle, are characteristic of hyaline parovarian cyst. The possibility of feeling the ovary and tube upon the same side as the tumor has been considered pathognomonic. For the recognition of dermoid cysts[52] we have the possibility of making an impression upon a tumor filled with fatty matter, or even of hearing the friction of the contained hairs.[53]

Diagnosis of Adhesions.—For the recognition of parietal adhesions, Spencer Wells notes whether a change of position on the part of the patient, or respiratory movements, causes motion of the neoplasm. In moving the abdominal walls in front of the tumor, we notice whether the umbilicus glides easily over it, and we may hear a grating sound, or a sound like the creaking of new leather, which indicates some action of adhesive peritonitis. Any tumor which has long been of large size is usually adherent to the anterior abdominal wall or to the epiploön unless there be some ascites present. Adhesions to the viscera can be suspected only when there are external signs of acute peritonitis after puncture, torsion of the pedicle, or rupture of the cyst.

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27. Cohn: Die bösartigen Geschwülste der Eierstöcke. Zeitschr. für Geb. und Gyn., Bd. xii., Heft 1, 1886.

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30. Cohn: Loc. cit. (27).

31. Leopold: Ueber die Häufigkeit der malignen Tumoren und ihre operative Behandlung. Deutsche med. Wochenschr., 1887, No. 4.

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33. Metzlar (reviewed in Centr. für Gynäk., 1889, No. 40) quotes a case of imaginary tumor due to lordosis, for which they came very near to performing laparatomy.

34. Iverson (Howitz Gyn. og Obst. Medelelser, Bd. vii., Heft 1-2, p. 63) reports an instructive case: the patient was 39 years of age and had had ten children; there was manifest fluctuation and great mobility of the tumor. A diagnosis was made of cyst, but laparatomy showed a four months' pregnancy with elongation of the supra-vaginal portion of the cervix and hydramnios; death resulted from peritonitis.

35. Pinard: Article sur Grossesse du Dictionnaire Encycl. des Sciences Médicales.

36. This error was committed with fatal results for both mother and child, in the hospital at Jassy. The case was much talked of at the time (Grossesse de sept Mois prise pour un Kyste; France Médicale, March 27th, 1886.

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CHAPTER VII.

TREATMENT OF OVARIAN CYSTS.

I SHALL not dwell upon the medical treatment, which I consider responsible for the death of many patients, in having often prevented operations at the proper moment. Diuretics and diaphoretics, mercurial and iodized preparations, ergot of rye, etc., owe the success claimed for them to ignorance of the pauses often met with in these diseases. The only rational internal treatment consists in the administration of tonics, stomachics, and simple laxatives to support the digestive system. Electrolysis, of the use of which there has been an actual abuse in gynæcology, is both useless and dangerous in these cases. Every ovarian cyst should, if possible, be removed.

Puncture through the abdominal wall was also too frequently used as a palliative before ovariotomy came into general use. Some patients have had cysts evacuated an incredible number of times. Where there are symptoms of extreme pressure, or where the tumors absolutely cannot be operated upon, puncture is sometimes urgently called for. The trocar is then to be inserted by preference in the linea alba, or at some spot where there is dulness on percussion. Unnecessary puncture of a cyst which can be removed is bad practice. Peritonitis may result, or, at the very least, the formation of adhesions. Some authorities wish to make an exception in favor of cysts of the broad ligament, the unilocular cysts with thin walls and transparent contents, hyaline parovarian cysts.[1] But against the few cases of recovery, well authenticated but not followed a sufficient length of time to judge of their permanent value, we must place the many cases of relapse. Moreover, puncture is really dangerous from the point of view of metastatic generalization of papillary cysts of the broad ligament, which it is almost impossible to differentiate beforehand from purely serous cysts. If, on the other hand, we consider the great benignity of ovariotomy in these cases, we cannot hesitate in giving it the preference over a method which can boast of a few successes, but has to acknowledge many untoward results.

Puncture has usually been practised through the abdominal walls;

it has also been done through the vagina where the tumor was small and more easily accessible in that way. It is a hazardous practice because of the danger of consecutive infection and grave suppuration, especially in the case of a dermoid cyst. Tavignot does not hesitate to recommend puncture through the rectum; I consider this a detestable operation.

Injection of iodine, enthusiastically recommended by Boinet,[2] has few advocates at present; a few surgeons still employ it in the case of unilocular thin-walled cysts. Even for these it is more dangerous than ovariotomy, and was of use only in the days when the latter operation was regarded as hazardous.

Drainage after puncture or incision[3] was at the same date applied to cysts which could have been removed with ease; it was attended by a few good results, and by many deaths from hectic (hecticité) and septic infections. Drainage should no longer be used except for the remains of cyst sacs which it has not been possible to remove (as I shall describe later) or when a suppurating cyst non-amenable to operation has spontaneously opened externally.

OVARIOTOMY—*Historical Outline.*—Ephraim MacDowell (of Kentucky), a pupil of John Bell (of Edinburgh), was the first to do an ovariotomy for ovarian cyst, in 1809. The pedicle was left in the abdomen; a cure followed. Another American, Nathan Smith (of New Haven, Conn.), was the second ovariotomist. Allan Smith was the third. His first successes date from 1827.

These were isolated cases of bold operation which found no imitators. J. L. Atlee, in 1843, performed the first double ovariotomy; and in the following year, Washington L. Altlee, who must not be confounded with him, began his remarkable series of operations, which in 1871 reached the number of 246. Ovariotomy was thoroughly established in America after the year 1865 (Peaslee[4]). In England, Lizars (of Edinburgh), inspired by the success of MacDowell's cases, made an abdominal opening in 1824 from an error of diagnosis, and the next year for ovarian cysts, of which he cured one out of three cases. Granville (of London) had two failures, which discouraged him, and until the year 1842 the operation fell into discredit. Walsh and Clay rehabilitated it by a remarkable series of successes. Then came those of Bird and Baker-Brown, and finally of Spencer Wells[5] (1858).

In Germany, Chrysman, in 1820, made an unfortunate attempt. A few isolated operators, among whom we may mention Stilling, hazarded the operation, but it was not definitely adopted.[6]

In France, Woyerskowsky (1844) was probably the first to perform ovariotomy. In 1856 the operation was condemned by the Academy, with only Cazeaux to protest. In 1862, Nélaton went to see Spencer Wells, and upon his return performed ovariotomy without success. But Kœberlé, in 1864, reported 9 cures out of 12 cases; and then Péan demonstrated in a striking manner that the operation could be successfully performed in Paris. The adoption of ovariotomy in France is due to these two men.[7]

At this juncture the introduction of antisepsis opened a new phase of existence for the operation, which passed from the hands of a few eminent specialists into those of all surgeons.

To recapitulate, ovariotomy has passed through three successive stages: 1st. A phase of groping, which came to an end first in America with W. L. Atlee, in England with Baker-Brown and Spencer Wells, in France with Kœberlé and Péan. 2d. A short period of excessive specialization, to which is attached the names of the initiators of the movement, already given. 3d. A phase of popular adoption, under the powerful impulse given by the introduction of antiseptics.

General Indications.—It is no longer necessary to dwell at great length upon this part of our subject, since many questions which were a subject of debate, even recently, have been settled.[8] Some surgeons, basing their views upon the possibility of curing hyaline parovarian cysts after simple puncture, as shown by Terrillon's[9] somewhat optimistic report of one cure in three cases, advise puncture, with an operation in the case of relapse. This procedure would assuredly be wise could we always be certain of never confounding a hyaline and papillary cyst. But inasmuch as such a distinction is often impossible before puncture, and as puncture is very dangerous in the second event, I cannot but feel that it is better to perform ovariotomy at once, the operation being in simple cases perfectly free from danger.

We can then no longer say that laparatomy should be reserved for cases where the cyst is so large as to seriously inconvenience the patient or to threaten life. As soon as an ovarian cyst is large enough to be recognized, it should be removed: in the first place because the operation itself is less serious, since a small incision only need be made, and there are no adhesions to break down; in the second place because the patient is spared the dangers of inflammation, rupture of the cyst, or torsion of the pedicle; finally and above all, because any

ovarian cyst is, if one may so express it, a neoplasm of unstable equilibrium between benignity and malignity. Out of 658 cysts removed by Schröder, Cohn[10] found 100 degenerated into malignant tumors, or 16%; Leopold[11] counted 26 out of 116 (22.4%); J. B. Schultze,[12] out of a small series of 33 cases, found 9 malignant cases (27%). This proportion may be somewhat high, owing to the fact that only grave and difficult cases were brought to these great operators.

Yet, beyond doubt, they may be taken as an indication of the frequency of malignant degeneration of cysts. Poupinel[13] reaches the same conclusions. Now, to remove a cyst which has already undergone degeneration, is to perform a much more serious operation (Cohn), and to grant a mere respite to the patient instead of a cure.

This neoplastic transformation is to be suspected when a tumor which has long been quiescent suddenly and rapidly develops within a few months. Yet, even though the diagnosis of this change be absolute, the operation had better be performed. Cohn found that out of 86 patients operated upon under these conditions, 19.5% were still cured at the end of a year, and in 5 cases the cure was maintained for from three to four and a half years. Before such results there should be no hesitation. Freund,[14] in a recently published work, has reached the same conclusions. One of the most remarkable cases of peritoneal metastasis of glandular cyst, followed by a cure by laparatomy, has been reported by Runge.[15] The patient was forty years old; the tumor had developed in five months; the whole of the peritoneal cavity contained scattered masses of gelatinous matter, which also filled the cyst. This tumor was evidently malignant, yet six months after the operation the patient was still in good condition. We cannot, however, ignore the fact that the surgeon may meet with cruel disappointments, and a relapse with a rapid course carry off the patient in a few days. Hofmeier[16] quotes two cases which he observed, where the patients died, one seventeen and the other twenty-five days after ovariotomy. In the first case no trace of generalization in the peritoneal cavity could be found at the time of operation, but at the autopsy the whole of the peritoneum was covered with a carcinomatous layer as thick as the finger, the whole epiploön was changed to a thick, hard mass, so that it seemed actually incredible that it could have been in normal condition a few days previously. In the second case, peritoneal metastasis had already begun at the time of operation.

As I said before, it is impossible to separate from papillary ovarian cysts those solid tumors erroneously called papillomata, which

are usually nothing but papillary cysts which have ruptured into the peritoneal cavity. In this last stage of their development, papillary cysts reduced to their solid portions, surrounded by ascites resulting from the irritation of the peritoneum caused by their falling epithelium, and scattering on every side débris that becomes grafted here and there upon the serous membrane, really take possession of the peritoneum and convert it into a cystic cavity. Even at this stage, laparatomy may bring about a permanent cure of these cysts, which were considered not so very long ago by ovariotomists as veritable *noli me tangere;* unexpected success in certain cases may be compared to that given by laparatomy in some cases of tubercular peritonitis. Knowsley Thornton [17] quotes a case of cure of this kind which had lasted nine years; Leopold,[18] one of two years' standing; Cohn,[19] a case of Schröder's of two and a half years'; French,[20] also, has had some permanent cures. Lomer [21] reports a remarkable case; small papillomatous excrescences were scattered upon the epiploön, from which they could be detached, and upon the intestines and the parietal peritoneum, from which they could not be detached; the cure was still perfect five years after the operation. I operated [22] upon an exactly similar case eleven years ago, with Terrier's assistance, and the patient is still in perfect health. These lesions, therefore, should not be considered beyond the aid of surgical science, although their prognosis is always uncertain, and influenced by factors as yet unknown.

The age of the patient should not form a contra-indiction. Quite young children have been successfully operated upon: Bell [23] extirpated a unilocular cyst, containing eight pints of fluid, from a young girl of thirteen years; Heinricius [24] performed ovariotomy and cured a child of twelve years; Balling [25] operated upon a girl of thirteen; Cameron [26] published the report of a similar case; Polotebnoff [27] performed ovariotomy on a child of nine years; W. Mackenzie [28] extirpated a cyst from a child of eight and a half years; R. C. Lucas [29] operated upon a child of seven years.

On the other hand, some very aged women have been cured by the operation; we must, however, in these cases be on our guard against the evil effects of prolonged decubitus (hypostatic pulmonary congestion, eschars on the sacrum) and have the patients leave their beds and take a sitting posture soon after the operation, as F. Barnes advises. Johnson [30] cured a woman of sixty-four years by operation; Davis [31] records a successful operation at sixty-five years, Pinnock [32] at sixty-seven, Josephson [33] at seventy-six, Terrier [34] at seventy-seven, Owen [35]

at eighty, Hoffmann[86] at eighty-two, and Homans[87] at eighty-two years and four months.

Technique of Ovariotomy. Cysts with Pedicles.—For preliminary precautionary measures, see page 17 *et seq.*, Vol. I.

It seems to me that the frequent use of laxatives both before and after the operation is sufficient to assure antisepsis of the digestive tract, so strongly insisted upon by Terrier; it is only in exceptional cases, especially where there has been evacuation of purulent matter through the rectum, that I administer naphthol β and salicylate of bismuth to thoroughly disinfect the intestines.

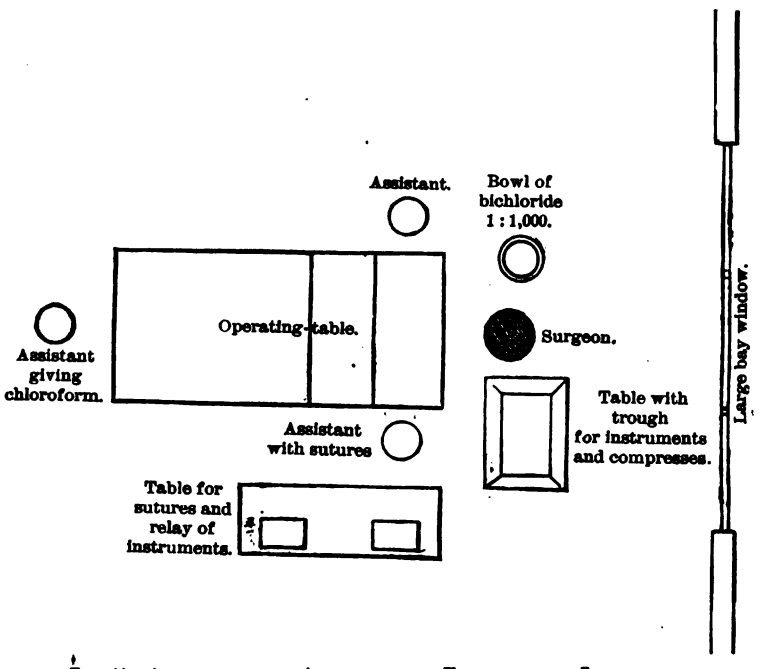

FIG. 44.—ARRANGEMENT OF ASSISTANTS AND FURNITURE FOR LAPARATOMY.

Many surgeons will not undertake ovariotomy unless they are surrounded by a complete armamentarium of instruments—forceps of every shape and size, bistouries, scissors, retractors, needle-holders, etc. It seems to me advisable to reduce the number of instruments used to those which are absolutely necessary, in order as far as possible to avoid infection. It will be quite sufficient to have: Good bistouries; dissecting forceps; a female and a male catheter; a grooved director; scissors, one pair curved laterally; a few ordinary hæmostatic forceps; long forceps, straight and curved, for adhesions; two of Néla-

ton's cyst forceps; one Museux forceps; one trocar; one pair of needle-holder forceps; needles, and one blunt mounted needle; silk, catgut, and gauze compresses. All of these instruments should be absolutely reserved for laparatomies, and, as I have already said, have been kept for an hour in an oven at 248° F. They are to be placed within reach of the operator's hand in a flat dish filled with a 2% carbolized solution. It will be well to keep upon a neighboring table a relay of instruments—forceps, bistouries, etc.—for emergencies (Fig. 44).

Surgeons who use sponges advise that they be counted before and after the operation, because of the danger of small sponges being lost in the abdominal cavity; this may happen even when they are held by forceps, as the latter sometimes relax. For my part, I have entirely given up the use of sponges, and I do not fear any such accident with the gauze compresses I use, whose end always protrudes through the abdominal wound. It is well, however, to place a pair of forceps on them, one with gilded handles if possible. It may be well to count the number of forceps, remembering the case of Spencer Wells, who, owing to this precaution, reopened the abdomen and found the missing instrument. But the opposite error might be committed if a pair of forceps had slipped under a basin or had been carried off attached to the tumor or to a sponge.[88] I think it will be quite sufficient to keep a careful watch over the instruments.

The number of assistants should be limited to as few as possible: one for the chloroform, one to thread and pass the needles or the ligatures (which should be already cut and kept in a carbolized or weak bichoride solution); a third skilled assistant will suffice to help the surgeon; he should be on the left of the patient, while the one in charge of the sutures is on her right and consequently on the surgeon's left, and near enough to hand the sutures readily to him. If there is not a skilled assistant obtainable, there must be two assistants, one to the right and one to the left. No one but the assistants are to touch an instrument or any article used in the operation. If an instrument falls to the ground, it must be left there.

The operation of ovariotomy may be divided into four stages:

First Stage—Opening of the Abdomen.—It is best to begin with a small opening, which can be subsequently enlarged if necessary. While the assistant places his index finger on the umbilicus as a guide, making slight traction on the skin, the surgeon with a strong convex bistoury makes an incision three and a half inches long in the linea alba, reaching inferiorly almost to the symphysis.

The skin and cellular tissue are rapidly cut through, and we then attempt to penetrate in the space between the recti muscles, which is first to be sought at the upper part of the wound. If their sheath should be opened it is of no great importance. Next we come to the fascia transversalis and the subperitoneal fat, which is not to be mistaken for the great omentum. The fatty masses, which are often numerous, are to be incised, and even excised if necessary, and we then reach the serous membrane. Before opening it, we must assure complete hæmostasis by placing two or three forceps upon bleeding points. The peritoneum is grasped with the dissecting forceps at the upper part of the wound, and a small buttonhole cut in the uplifted portion; a grooved director is introduced from above downward in the median line, and the peritoneum is freely incised, either with a bistoury or the scissors. We must now lift up the peritoneum with the sound, and, if necessary, examine it by transmitted light, to be perfectly sure that we are not wounding an abnormally developed bladder.

(Wounding of the bladder is an accident which has happened, even to experienced operators, in cases where a subperitoneal tumor has by traction elongated the bladder, which, when emptied, is unrecognizable and might easily be taken for a thickened false membrance. I myself had to render assistance in a case of the kind where the wound was eight inches long and included both the extra- and intra-peritoneal surfaces of the urinary reservoir.[39] In this case I sutured the whole bladder, with the exception of a small anterior buttonhole, in which I placed a siphon; after the recovery of the patient this orifice was easily obliterated. Newly published works by Reverdin and Sänger advise the trial of a complete suture. In a case where he had taken away a portion of the bladder, Sänger [40] sutured it with silk, and fixed it to the lower part of the wound, drawing the peritoneum down in front of it; next came pre-vesical drainage and suture of the abdominal walls above the vesical stump; a cure resulted. Leopold,[41] having removed the top of the bladder in the course of a hysterectomy, made complete sero-serous sutures, and cured his patient. I believe that it would be a good plan to make two layers of sutures, either with separate stitches as in Czerny's process for intestinal suture, or by continuous suture. By this method I had a very successful result.[42] Silk is to be preferred in ovariotomy where the pedicle is dropped, because there is no danger of its secondary infection, as there is in hysterectomy with an external pedicle destined to slough.)

In some rare cases the peritoneum may be so adherent to the anterior wall of the cyst that it is impossible to tell them apart. We must in that case prolong the incision above until we reach a point where the serous membrane is free, and then proceed to detach it from above downward. This is much better than cutting directly into the cyst and detaching it by traction upon its internal surface.

Second Stage—Rupture of Adhesions; Evacuation.—A. Adhesions to the Abdominal Wall.—The right hand is introduced flatly into the wound upon the surface of the cyst, and by working about with its ulnar edge loosens the adhesions to the right and to the left as far as it can. We can perfectly recognize any adhesions which are too strong to be broken down by simple pressure, and we do not expend any unnecessary force upon them, as we can break them later after evacuation of the cyst.

B. Adhesions to the Omentum.—These are loosened in the same way, using both hands if necessary. Catgut ligatures are to be immediately placed upon bleeding points. If certain adhesions are too resistant, they may be grasped by two pairs of forceps in juxtaposition, and an incision made between the forceps, after which they are ligated with catgut. This method should be substitued for Hegar's process of elastic ligature *en masse.*

C. Adhesions to the Intestines.—Loose adhesions may be detached as described above; those which are moderately firm yield to tension and pressure combined, brought to bear alternately upon the cystic and the intestinal wall, and always done with the fingers well covered by gauze compresses. Should the intestine bleed at any special point, a few separate catgut stitches may be taken with a fine needle. Should the hemorrhage come from an extended surface, we must endeavor to overcome it by somewhat prolonged pressure; and if that be not sufficient, we must apply a strong carbolic solution. Hegar recommends radiated heat from a thermo-cautery held at some distance. Finally, if separation of the intestine seem to threaten danger, we would better abandon our attempts to detach it, and proceed in the manner described in the chapter on Hysterectomy (p. 281, Vol. I.), leaving a thin layer of the cystic wall adherent to the intestine, which is freed by minute dissection. But we shall have to cauterize this layer in order to destroy any epithelial elements originating from the cyst wall. Moreover, before beginning to detach intestinal adhesions of any extent, we must always ascertain their number and importance, and, if there are too many of them, abandon the attempt,

and limit our operation to an exploratory incision or treat the cyst by sewing its edges to the wound and stuffing it with gauze (marsupialization, see below), according to circumstances.

D. Pelvic Adhesions.—In the case of small tumors, we must look for adhesions before puncturing; in the case of large tumors, we shall first be obliged to diminish their volume in order to glide the hand into the pelvic cavity; at the same time, we must draw them forward with Nélaton's forceps. An error to be avoided is the mistaking of an intra-ligamentous tumor for a cyst bound down by large adhesions; a cyst of this kind could only be detached by opening its peritoneal covering, as I shall describe later.

Pelvic adhesions may be broken with the hand; and if we are obliged to use the scissors, we must always cut between two forceps or two ligatures. The pelvic portion of the pouch may be so adherent that it cannot be removed; in that case we must content ourselves with a partial or incomplete operation, whose technique I will point out later.

It is essential that small cysts should not be evacuated before all adhesions which can be loosened by the hand are broken down; the pressure is much more efficacious against a tense cyst than against a flaccid one, but incision of unyielding adhesions should be reserved until puncture of the cyst and its collapse permit us to see what we are doing.

The cyst may be evacuated with the bistoury, as is the custom in England; but although this method is expeditious, it exposes the wound to the danger of infection so soon as the flow of the liquid becomes slackened; the trocar seems to me preferable.

It may be necessary to puncture several cavities—which can sometimes be done without removing the trocar, by pushing it in more deeply or changing its direction. For very large cysts, it is well to have the trocar connected with a large receiver, in which a vacuum has been previously created.

If the tumor is microcystic and areolar, and non-reducible by puncture, we must not hestitate to enlarge the abdominal opening with the scissors as far as the umbilicus, cutting through all the layers with one stroke; whatever may have been said to the contrary, there is really no special object gained by cutting around the umbilicus if the incision has to go beyond it.

Third Stage—Extraction of the Cyst and Ligation of the Pedicle.—The trocar is removed with a quick motion, while the assistant

presses down the edges of the wound. Nélaton's forceps are placed over the puncture to obliterate it and facilitate traction. A second pair of similar forceps or of Museux's forceps are placed on a suitable spot, and the delivery of the cyst is begun by gentle traction alternating with a sidewise motion. As the cyst becomes freed, an assistant presses upon the abdominal walls and approximates the lips of the wound, so that when the cyst is entirely freed the edges are closed over the pedicle, thus preventing escape of the intestines. If, during the extraction, firm adhesions have to be broken down, the assistant must lift up the intestines with a warm gauze compress, and if necessary the edges of the wound can be held apart by retractors, and the adhesions, which are rarely vascular, cut with the scissors between two ligatures.

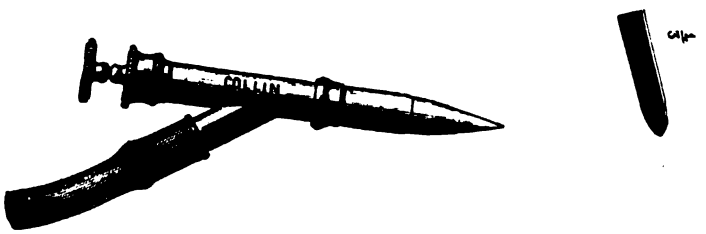

FIG. 45.—TROCAR WITH ROUNDED POINT AND LATERAL DISCHARGE TUBE.

The pedicle is now to be tied, separated from the tumor, and left in the abdomen. This intra-peritoneal method was the one adopted by the earlier operators, and was abandoned later for the extra-peritoneal treatment of the pedicle, which remained in use until 1880, when the intra-peritoneal method again came into general use. In 1841, Stilling[43] was the one to reintroduce the intra-peritoneal method in Germany; in England, Duffin gave it a place of honor in 1850, but its general adoption was due to Spencer Wells.[44] Previous to this, the pedicle was simply fastened into the abdominal wound, being held by needles or points of suture.

A clamp was invented by Hutchinson, to grasp the pedicle, keep it in place, and secure hæmostasis, and was enthusiastically adopted. Spencer Wells, Atlee, Wilde, Kœberlé, Hegar, and Kaltenbach also invented several varieties of the same instrument. Clay and Baker-Brown introduced a cautery-clamp which combined compression and cauterization. In Paris, surgeons simply used crucial transfixion by long and strong needles, with constriction by means of Cintrat's ligature-tightener.

The chief objections to extra-peritoneal treatment of the pedicle are: its sloughing, which is usually quite extensive and may cause infection of the wound; and weakening of the abdominal cicatrix, creating a predisposition to hernia. Still, this method may be used where, besides the ovarian cyst, we have to overcome either a prolapsus or pronounced retroflexion of the uterus, in which case it additionally performs a gastro-hysteropexy.

It is quite exceptional to find a pedicle so slender as to merely require the passing around and tying of a silken ligature. It is always best to transfix it and tie it with Tait's or Bantock's knot, either one of which can be tightly drawn. If necessary, a chain ligature can be applied (pp. 54 to 59, Vol. I.). When the pedicle is short, it is well to have all the sutures in place before detaching the tumor, and to have the incision at least half an inch above the threads; or successive portions may be tied and cut. We shall thus avoid the retraction of the pedicle, which is apt to occur when it is prematurely cut across, and when it is deeply situated in the pelvis. If it is very thick and fleshy, and not easily distinguishable from the rest of the tumor, it will be advisable to squeeze it tightly with strong adhesion forceps (Fig. 49, Vol. I.) or, better yet, with Billroth's clamp (Fig. 48, Vol. I.); at the end of a few minutes we shall have a groove which will hold the ligature, and hæmostasis will be already partly accomplished by the crushing of the tissues.

After detaching the tumor, all the threads are cut a quarter of an inch above the knot. In the first place, however, we look upon the cut surface for the lumina of large vessels, and tie them separately with fine silk or catgut. If the pedicle be exceptionally fleshy and soft, or if the surface of the section contain tissue open to suspicion, or if there be any signs of tubal inflammation, we must employ the thermo-cautery. Neighboring parts are to be carefully protected with moist gauze compresses. Some authorities,[45] with a view to avoiding future adhesions to the intestines and the production of internal strangulation, advise suturing the two edges of the peritoneal wound above the pedicle; this seems to be an unnecessary complication of the operation, as adventitious membranes very soon encapsulate the pedicle.

The surgeon now carefully examines the ovary of the opposite side, and if it be ever so slightly affected, and the patient drawing near to the end of sexual activity, he removes it. If she is still young and the lesion slight, be might follow the bold example of Schröder,[46]

who in a similar case merely removed a small dermoid cyst from the ovary and sewed up the wound. The woman shortly afterward became pregnant, and was safely delivered. Schröder has performed this resection of the ovary four times in young women. A. Martin [47] has since followed his example. The uterus likewise should be carefully examined, and any fibroids enucleated if the patient is young and the situation of the tumors favorable; if the patient be approaching the menopause or if myomotomy for any reason be difficult of execution, the removal of the second ovary is preferable.

Fourth Stage—Toilet of the Peritoneum and Closure of the Abdomen.—When the operation has been a simple one, without any effusion of irritating fluid, it is unnecessary to sponge off the small amount of blood which there may be in the pelvis, and which will be rapidly absorbed,[48] as the friction of the compresses unavoidably rubs off some of the endothelium from the surface of the peritoneum, and detaches some of the small clots which plug the vascular orifices; fresh hemorrhage may result from their use. But when the cystic fluid or pus has contaminated the operation field, the surgeon's behavior must be radically different. In the first case, the use of gauze compresses will be sufficient; the finger is covered by one and pushed into every dependent portion of the pelvis; to reach the cul-de-sac of Douglas, the gauze is wrapped around the forceps. When there has been effusion of pus or of very septic cystic fluid, irrigation of the peritoneum is indicated (p. 22, Vol. I.). I have previously stated the conditions which call for drainage or tamponade (pp. 69 to 77, Vol. I.).

There remains merely the closure of the abdomen; having fully described the process (pp. 50 to 53, Vol. I.), I shall not repeat. My method of mixed suture [49] (a continuous suture in two layers for the peritoneum and aponeuroses, and the interrupted suture for the skin) avoids all danger of hernia, or eventration, so frequent after the suture *en masse* in general use.[50]

If there be oozing from an extended surface of the internal abdominal wall because of the tearing away of large adhesions, causing us to fear capillary hemorrhage after closure of the wound, we can insert a series of quilled sutures (using little rolls of iodoform gauze instead of quills) through the abdominal wall, over the area of these excoriations of the serous membrane, and in this way approximate the bleeding surfaces, lifting them up into a ridge and keeping them pressed against each other. The accessory sutures are to be left in place for two or three days.[51]

The operation which I have just described is the one most generally used for the removal of cysts with a pedicle. I will now mention two important operative conditions sometimes met with, one relating to the absence of a pedicle, the other to the impossibility of forming one.

ENUCLEATION OF CYSTS CONTAINED WITHIN THE BROAD LIGAMENT, OR OF RETRO-PERITONEAL CYSTS.—I will at once eliminate from this category metastatic subperitoneal masses found in the cul-de-sac of Douglas or in the iliac fossæ, as well as pediculated tumors of one or both ovaries. To attempt the removal of these microcystic and colloid formations, which may be said to be infiltrated beneath the serous membrane rather than to be included in it, is to meet with almost certain failure; it is rarely possible to remove them completely, and the enormous amount of tearing away that has to be done, combined with the portions of the neoplasms which have to be left in place, is quite sufficient to cause septic infection. In such cases we have to content ourselves with a removal of the pediculated ovarian tumor, leaving the secondary growths where they are, or we may even have to close the wound again, without removing anything, if we find that there are too many adhesions to allow of a successful result.

Parovarian Hyaline Cysts.—These thin-walled cysts with limpid contents, originating within the folds of the broad ligament, may travel under the peritoneum as far as the meso-colon and the mesentery. They are easily separated from the serous membrane, which does not adhere to them unless there have been previous inflammation. When they are fully identified, a little fold is to be taken in the peritoneum covering them, a small opening made in it, and the finger introduced through this opening to loosen the membrane over a small surface. The trocar is then inserted into this freed space, and the fluid taken out. When the trocar has been removed, and the opening closed by means of forceps, the peritoneum is disengaged from a larger extent of surface, and by a series of tractions, aided by movements of the fingers which break down any cellular adhesions, the whole cystic sac is removed. Hæmostatic forceps are at once placed upon any bleeding points. The cavity left by the enucleation will close of itself.[52]

The operation is much more difficult when there are adhesions resulting from the inflammation which often follows intra-cystic hemorrhages: this occurrence is recognized by the color of the fluid and brownish deposits on the cyst wall. I twice found myself in a pre-

dicament of this kind, and only managed to extricate myself by recourse to the following procedure; extensive incision of the sac; fixation of the edges of the wound with a series of forceps, held by an assistant; introduction of the left hand into the interior of the cyst to determine its relations and assist in its enucleation. It is of the utmost importance that all this be done methodically, and not by a series of scattered efforts, and that the ovary, if normal, be spared.

Large Papillary and Glandular Cysts of the Broad Ligament.—Whatever may be the anatomical differences between these cysts, I have chosen to describe them together, because of the similarity of the operative procedures necessary. I have already said that papillary cysts of the broad ligament,[53] although doubtless originating from the parovarium (either from its intra-ligamental portion or from the part which penetrates into the hilum of the ovary), are not the ones usually called parovarian cysts by clinicians. They apply the term to the hyaline parovarian cyst alone, which is indeed the more frequent of the two. The sac of the papillary parovarian cysts is thick and often contains unstriped muscle fibres which seem to unite it to the uterus; the fluid contents are turbid or milky, and they contain cauliflower growths. In the thickness and vascularity of their walls they resemble the glandular or papillary ovarian cysts. The latter, either because of their origin from the hilum (papillary cysts), or because of a semi-heterotopic development, or from congenital predisposition (glandular cysts), may, instead of becoming pediculated, push in between the folds of the broad ligament. The intimate relations with the peritoneum, uterus, pelvic floor and walls, constitute additional points of resemblance. The cardinal difference, from the point of view of these anatomical relations, consists in the freedom of the ovary in the case of parovarian cysts, and its fusion with the tumor in the case of ovarian cysts. Important as this distinction may be anatomically, it is of little value from an operative standpoint.

The separation of all cysts situated within the broad ligament is very difficult on account of the adhesion of the peritoneal membrane, which often can only be removed in shreds; the presence of deeply situated blood-vessels is a further complication; and there is always danger of pulling out or wounding the ureter, with which the cyst has close relations.

(There is a difference between the immediate treatment demanded when the ureter has been wounded and that called for at a later stage, when the patient has made a good recovery, but has a persistent

uretero-abdominal or uretero-vaginal fistula. The second case comes under the head of urinary fistulæ, and I will simply remind you of the fact that Simon was the first to perform nephrectomy for a case of this kind.

The immediate treatment consists in suturing the wound and in catheterization, first through the bladder [Pawlik and Simon's method, pp. 120–128, Vol. I.] and then through the abdominal wound. I think that it would be prudent to have an antiseptic tamponade of the peritoneum above the wounded organ, for union may not occur, and the urine must be given a chance to escape. Our hopes will then rest upon the formation of protective adhesions. Schopf,[54] in a case of ovariotomy for intra-ligamental cyst where the ureter was wounded, first placed forceps temporarily upon the two ends, and then united these ends by eight stitches of silk, which did not include the mucous membrane. There was a temporary cure of four weeks' duration, and then various supervening accidents caused the death of the patient. At the autopsy, amyloid degeneration of the kidneys and plastic peritonitis were found. In another case, the same operator preferred to unite the wound over an English rubber catheter, which was passed in through the urethra in such a way as not to take up the whole canal and obstruct the flow of urine from the other kidney. Gusserow[55] tied the ureter under the following conditions: During the course of an enucleation of a malignant intra-ligamental cyst, a small flap of the tumor which could not be removed was ligated to the lower part of the wound; the ureter must have been caught in the ligature, for on the ninth day a large abscess formed, and septic peritonitis supervened, the patient dying on the fifteenth day. Under such circumstances, Gusserow advises opening the purulent mass through the posterior cul-de-sac of the vagina, in order to form a uretero-vaginal fistula. I should prefer antiseptic tamponade of the peritoneum.)

The cyst having been emptied, the first thing; the most prominent part of its wall is then grasped with Nélaton's forceps and drawn out through the abdominal wound; with a bistoury a large ellipse is traced around as much of the sac as has been drawn through the opening. The incision goes through the peritoneal covering only if possible, which is then detached by the help of forceps, spatula, and the finger, so as to dissect out a circular flap which is deeper at the sides than in the middle, as it follows the shape of the cyst. This process of detaching had better be begun at the more vascular por-

tion, and the large vessels supplying the secondary branches can be tied at once. An assistant should hold a sound in the uterus as a guide to its position, for it is often so displaced or hidden by the tumor that we can only find it with great difficulty. To detach the uterine adhesions, the organ should be lifted out of the abdomen and laid upon gauze compresses. In some cases we may have to perform hysterectomy to simplify matters and terminate an operation of long duration.

Permanent hæmostasis is to be obtained either by ligatures or by a continuous catgut suture, applied superficially to the whole of the bleeding surface, to avoid wounding deep vessels. Temporary pressure with gauze compresses and application of the thermo-cautery may be needed for persistent capillary hemorrhages.

If these methods fail, I would suggest tamponade of the peritoneum by means of iodoform gauze, and forcipressure, bringing the handles of the forceps together at the lower end of the wound.

When the operation is finished, the size of the intra-abdominal wound is to be diminished as much as possible by approximating the flaps of peritoneum, at the same time paring off any ragged edges. If the cavity is too deep to be filled up by a continuous catgut suture of the broad ligament, then we must contrive a way to isolate it from the rest of the abdominal cavity. According to circumstances, we may either suture the edges of the sac to the abdominal wound and tampon it with iodoform gauze, or introduce a T-tube through the bottom of the sac into the posterior vaginal cul-de-sac, and then sew up the side of the sac toward the peritoneum with catgut (Martin). This tube may be most readily introduced through the vagina from below upward, according to the rules already given.

Incomplete Operations.—Marsupialization of the Cyst.—When the tenacity of adhesions to the pelvic walls or to the folds of the broad ligament prevent either the formation of a pedicle or enucleation of the tumor, there is still one resource left to the surgeon. This consists in fastening the edges of the pouch to the lips of the abdominal wall, filling up the cavity with tampons, or draining it as one would an abscess cavity, leaving to nature the care of obliterating or eliminating it. Before fixing it to the abdominal wall, we must close the upper part of the wound, leaving only the length necessary to the accomplishment of our purpose. The edges of the open sac are held outside of the wound by an assistant; if necessary, we can take folds in them by the aid of forceps and the insertion of a stitch.

Then the circumference of the sac is fastened by means of a series of sutures with heavy silk, which traverses the whole thickness of the sac and of the abdominal walls an inch from the edge. The stitches are to be closely set together. A second row of superficial sutures fastens the skin alone to the sac. The interior of the cyst is carefully cleansed by removing all vegetations and secreting membrane and washing it with a sublimate solution; then a large drainage tube with only two holes at its inferior end is inserted, and iodoform gauze is loosely packed around it.

This method, recommended in outline by Clay, Spencer Wells, and Péan,[56] and adopted by other operators, is of course only a *pis aller*. It may give good results in the case of unilocular thin-walled cysts like the parovarian hyaline cysts, when they are surrounded by inflammatory adhesions; but we rarely have occasion to apply it in such cases. We usually have to use it for proliferous cysts, and then, especially if there are vegetations on the walls, the results are not brilliant. There is always a tendency to a return of the tumor, the abdominal fistula persists an indefinite length of time, and endless suppuration exposes the patient to the dangers of septicæmia and exhaustion.[57] Malignant degeneration has been known to occur in the wound. A careful cleansing of the interior of the sac with the fingers or the blunt curette, to remove all glandular elements, will do much to diminish the chances of these bad results. Rheinstädter,[58] who strongly recommends this method, obtained seven permanent cures by its use, four of which had lasted for over two years. In the most fortunate cases, the sloughs are entirely eliminated.

This process, because of its forming a pouch in front of the pubis something like the pouch of an opossum, has been given the name of marsupialization by some American writers.

In cases uncomplicated by large adhesions, an ovariotomy should always be very rapidly performed; the average length of the operation, including the suture of the abdominal walls, need not take longer than twenty minutes, as I know by personal experience. Every operation involving the peritoneum which lasts longer than an hour is rendered grave by that fact. There are some precautions to be observed which will tend to obviate danger: The assistant should keep the abdominal wound open to the least extent possible, and not expose the intestines or omentum, which should always be covered with warm, moist compresses; the operator should do as much of the operation as possible outside of the abdominal cavity, and must con-

stantly dip his hands in the 1 : 5,000, bichloride solution which is beside him. Evisceration or temporary extraction of the intestines, which are placed upon the abdomen, and wrapped in warm compresses, certainly gives the operator a clear field to work in, but the procedure is a serious one, as it causes desquamation of endo-epithelium and coagulation of the blood in the intestinal network of vessels, and may cause subsequent intestinal paralysis. It may be replaced by having the assistant forcibly push and maintain the intestines high in the abdomen, his hand being covered with a gauze compress, or the patient may be placed in the Trendelenburg position.

Dressing the wound is a very simple matter; in fact, when the edges of the wound are approximated, if the operation has been aseptic, we may say that there is theoretically no need of dressing, and that immobilization and compression are all-sufficient. I have had cases of perfect union when only cotton-batting was used. Still, it is best to guard against possible infection by the use of antisepsis for all that is not contained within the peritoneal cavity. I usually wash the abdomen with a bichloride solution, dust the line of suture lightly with iodoform, apply a compress of iodoform gauze torn into strips and loosely tossed over the wound, over that a layer of absorbent cotton, and then an elastic pad made of peat wrapped in gauze, and finally a flannel bandage going all around the body. There should not be too much wadding nor too heavy a pressure.

After-treatment. Accidents.—The catheter should be passed every three hours for two days at least, and longer if necessary. The bed upon which the patient is placed must have been previously warmed; her thighs should be slightly elevated by a cushion placed under the knees. If she be much weakened, and if syncope occur, she should be wrapped in hot cloths and given subcutaneous injections of ether.

Internal hemorrhage shortly after the operation sometimes occurs, and is manifested by sudden anguish, fainting, chills, cold sweats, and a feeble pulse; the face becomes pale, the extremities cold; if a drainage tube have been inserted, the blood will flow through it. In one case of this kind Hofmeier, suspecting this accident in a patient upon whom Schröder had operated, took out two of the stitches eight hours after ovariotomy, and found that the abdomen was full of clots, and that the ligature had slipped off the pedicle; he was able to save the patient. We should never hesitate to follow his example.

The food of the patient on the first day after the operation must

consist of a few pieces of ice, a little cold grog or some champagne *frappé* only, nor should these be given in large amount, for the best preventive of vomiting is an empty stomach. Vomiting due to chloroform has no prognostic importance. On the second day a little milk and Vichy water may be given. Some physicians administer opium to quiet the pain and give sleep; it is bad practice, and its chief effect is to paralyze the intestines.

FIG. 46.—GALANTE'S REFRIGERATING COIL.

On the third day, if the vomiting still continue, or if it reappear, and the matter vomited be of a greenish color, if the abdomen be painful and swollen, and the pulse frequent even though the temperature remain low, there is almost a certainty of septic peritonitis. It is well to remember that the pulse has a greater diagnostic value than the temperature. In fact, in surgical inflammations of the peritoneum the temperature is often subnormal. Before death the vomiting (at least at first) becomes almost incessant; the patient dies without great suffering, but with a little sub-delirium. Olshausen [59] long ago pointed out the septic nature of these symptoms. Peritonitis is rather a result than a cause of septicæmia. At the autopsy, besides meteorism, we find only a little turbid serum in the pelvis. Olshausen [60] attaches great importance to paralysis of the intestines, and the absorption of the toxic substances which they contain. Verchère,[61] as well as Sänger,[62] further developed this theory. We must be careful not to mistake this group of symptoms for intestinal obstruction, which it often simulates. It is probably true toxæmia caused by leucomaïnes and ptomaïnes originating either from the fluids in the abdomen or from

the gas and imprisoned matter in the paralyzed intestine. As to the starting-point of septic peritonitis, it has been said to be caused by the cessation of peristalsis due to exposure to the air, either from direct action of the air upon the muscular fibre or indirectly upon the nerves.

However that may be, one of the chief symptoms of the onset of peritonitis is intestinal paralysis, which is recognized not only by meteorism, but by the absence of evacuation of gases. This intestinal paralysis, in this case the result, may at times be the cause of peritonitis; it is of the utmost importance to treat it at the start. On the second day I usually administer an enema of six teaspoonfuls of Bordeaux wine and three teaspoonfuls of glycerin, in order to provoke slight peristalsis; if this does not cause any evacuation of gas, I repeat it on the following day, adding one or two teaspoonfuls of honey of mercurialis,[98] and I introduce into the anus a No. 20 rubber catheter, which should penetrate five inches, in order to allow of the issue of gases in spite of the tonicity of the sphincter. I think this preferable to the administration, by the mouth, of purgatives, which are often rejected by the stomach.[68]

[Calomel, given in doses of $\frac{1}{10}$ to $\frac{1}{6}$ gr. every half-hour for ten to eighteen doses is usually perfectly well borne by the stomach and is effective. If necessary it may be followed by tablespoonful doses of magnesia citrate in saturated solution, given at the same intervals. A somewhat more active enema than that recommended by the author is composed of two ounces of glycerite of ox gall, a drachm of spirits of turpentine, and a pint of strong peppermint water.]

After the fourth day, if everything be favorable, the patient may take a little solid nourishment.

On the eighth day the silk sutures are removed (the buried sutures remaining); union is usually complete by that time except in the vicinity of any folds which may overlap. The dressing is now changed for the first time, and another one put on after washing the abdomen with bichloride solution. On the fifteenth day the patient may sit in an arm-chair and a week later may walk a few steps.

After removal of the sutures, an attack of coughing or vomiting has been known to cause secondary disunion of the wound, with the production of intestinal hernia; there have been numerous cases in which this accident was without serious results if the viscera were cleaned and replaced, even after a lapse of several hours; I myself witnessed an example of this in one of my patients, in whom the

hernia occurred at the point of insertion of a drainage tube; a perfect cure followed.

An accident of rare occurrence is the production of emphysema of the abdominal walls, caused by retching; it is not especially grave in itself, but may lead to suppuration.[64]

Superficial abscesses may form at the point of suture when antisepsis has been imperfect or when the wound has been secondarily infected by a deeply placed drainage tube whose lower end was in contact with pus. As soon as there is induration and localized pain, we must hasten to reopen a small portion of the wound with a canulated sound, wash it with a strong antiseptic solution, and introduce two small drainage tubes.

Deep abscesses near the pedicle or sutures buried in the abdomen[65] are more difficult to recognize. If there be great elevation of temperature, and if by bimanual palpation we feel puffiness of a localized area, we should not hesitate to reopen the abdomen, evacuate the pus, clean the cavity, and establish drainage.

Parotiditis[66] has been mentioned as one of the accidents liable to occur during convalescence; it is rare, and also grave, since it indicates a certain amount of septicæmia; the prognosis is serious.

Subacute peritonitis may be present from the first, or it may not appear until the tenth or fifteenth day, originating doubtless in the septic mortification of the pedicle, or any other ligatures *en masse* that may have been left in the abdomen; I saw one case which evidently started from some ligatures of the omentum which had been made with poor catgut. Its onset is more insidious than that of the peritonitis which occurs at an earlier stage, and it assumes the form rather of peritoneal septicæmia. Elevation of temperature is rare; meteorism is observed, also vomiting of bilious and then of stercoraceous matter.[67]

Any treatment of the peritonitis is almost powerless to arrest it. As soon as it is apprehended, cold applications may be made to the abdomen, either by means of a bladder filled with ice, or, better yet, by means of Galante's ice coil (Fig. 46), through which constantly passes a stream of iced water. Small pieces of ice may be given by the mouth to relieve the nausea. I consider gaseous drinks, like Rivière's potion, more injurious than beneficial. As to morphine injections, I order them only when the case seems desperate. In these cases reopening of the abdomen has given only bad results. Schröder, Hofmeier, Hegar and Kaltenbach are unanimous in its

condemnation. I tried it once without success, but my one experience did not seem to me conclusive.

Among the more rare accidents, I will mention intestinal occlusion,[68] which has been attributed to adhesions near the buried ligatures or cut surfaces; it may even be favored by the destruction of the peritoneal endothelium caused by the use of sponges or compresses which have been soaked in too strong an antiseptic solution; hence the advice to wash them in boiling water before using them, and in general to be aseptic rather than antiseptic in the peritoneal cavity. Out of one thousand ovariotomies, Spencer Wells observed eleven deaths from intestinal occlusion. As treatment for this accident Bode and Leopold[69] recommend forced injections of hot chamomile infusion with oil and soap; several quarts should be injected, after which the patient is laid on her side. This method, in which Leopold has great faith, may be tried, but there must be no delay in reopening the wound and searching for the obstacle, which is usually an adhesion to the pedicle or to the abdominal wound.[70] In view of the latter possibility, we should proceed with great caution.

Other exceptional causes of death are tetanus,[71] phlebitis, and embolus.

Acute or chronic uræmia has been observed, due to the congestion of already diseased kidneys, by prolonged anæsthesia and traumatism.

Shock is a vague term applied to an accident of varied pathogenesis, which may be from unrecognized embolus and fatal uræmia, or paralysis of a heart already impaired by general marasmus.[72]

Gravity of the Operation.—The prognosis of ovariotomy, like that of all major operations, depends largely upon whether the case be a simple or a complicated one. Unfortunately there is no existing classification of cases made with the object of bringing out this point, neither would it be easy to make one. Yet, from the more recently published statistics, we may safely come to the conclusion that the extirpation of a cyst without extensive adhesions is at the present day a safe operation. The statistics are also very deficient in the causes of death, nevertheless it may be confidently stated that the greater number are due to septic peritonitis. The malignant tumors with large adhesions are the ones which raise the death-rate. A few operators will not undertake any but favorable cases. The following tables are borrowed from Olshausen:[73]

Spencer Wells,	1,000 cases	768 cures
Keith,	381 "	340 "
Kœberlé,	306 "	231 "
Thornton,	423 "	385 "
Tait,	405 "	372 "
Olshausen,	293 "	266 "
Schröder,	658 "	575 "

It would be interesting to analyze these reports in order to ascertain the diminution of the death rate following a greater perfection of technique on the part of the surgeon. Hofmeier[74] did this in the case of his instructor, Schröder, with the following result;

From 1 to 100,	17 deaths
" 100 " 200,	18 "
" 200 " 300,	7 "
" 300 " 400,	16 "
" 400 " 500,	7 "
" 500 " 600,	7 "
" 600 " 658,	11 "
658	83 deaths = 12.5%

Hofmeier remarks that of these deaths a very few were due to infection, and that the majority are due to grave accidents following the removal of malign tumors. Thus may be explained the high rate of eleven deaths out of the last fifty-eight cases. In the fifth and sixth hundred, there were two series of twenty and forty consecutive cures. Lawson Tait,[75] who in his first series of 1,000 operations had only 9.2% of deaths, and in a second similar series 5.3%, gives the following figures for his latest ovariotomies: Parovarian cysts, 1 death in 24; unilateral ovarian cysts, 6 deaths in 158; bilateral ovarian cysts, 2 in 78; cysts within the broad ligament, 12 cases without a death.

C. Braun,[76] in his second series of 100 ovariotomies representing operations performed between the years 1884 to 1887, had 13 deaths, or 93.5% of cures. But in this series he does not include 7 deaths which occurred after exploratory incision. G. Granville Bantock,[77] in his fourth hundred series of ovariotomies performed with simple aseptic precautions, had only 4 deaths as against 19 deaths in the first hundred by the Listerian method. Dohrn,[78] out of 100 ovariotomies performed between May, 1883, and April, 1889, had only 4 deaths.

Terrier[79] reports 175 ovariotomies from July, 1874, to February, 1888, with 34 deaths, or 19.3%.

Terrillon,[80] out of 138 ovariotomies, from September, 1887, to June, 1888, had 17 deaths, or 12.3%.

Results of the Operation.—In the case of benign tumors the patient usually makes a good recovery; although there is always a liability to a protrusion of the bowels through relaxation of the suture, unless it has been done with the special care I have described. Even then it is well to have the patient wear an abdominal belt to give slight compression; but it need not be of any special design as is needed when the cicatrix is of doubtful strength owing to there having been but one row of sutures.

A cyst of the other ovary or broad ligament may form later and necessitate reopening of the abdomen.[81] The surgeon when called to do a second operation should remember that there is a tendency on the part of the intestines to adhere to the first cicatrix; it is therefore more prudent to begin the new incision a trifle above the upper end of the previous one, and to insert a finger into the opening thus made and use it as a guide in finishing the incision from above downward. Thanks to this precaution, I have been able to avoid wounding intestines which were adherent over a large area, in a case upon which I performed a second laparatomy one year after the first. It was a case of parovarian hyaline cyst which developed upon the right side after the removal of a similar cyst upon the left. On the other hand, I knew of a second laparatomy performed by a surgeon of large experience, in which the small intestine was cut through when the cicatrix was incised; the patient died. I have already spoken of the question of a return of malignant tumors, and of generalization. You will remember that they are usually confined to the peritoneum, rarely invading the abdominal viscera and walls, still more rarely the lungs and mediastinal glands.[82]

Segond has even noted secondary degeneration of the axillary glands. Secondary tumors may be of an epithelial, sarcomatous, or mixed type (Poupinel). They develop rapidly and cause death in the same way as cancers. Is Terrillon[83] correct in holding that a small-sized pedicle implies a benign tumor? I believe this to be purely theoretical. The occurrence of carcinomatous infection mentioned by Nicaise[84] as following puncture of a malignant ovarian cyst seems to me to be simply an error of interpretation; he probably saw the formation of a nodule near the cicatrix and attributed it to the engraft-

ing of cells brought there by the trocar. A simpler interpretation is that of a metastatic neoplasm developed at the *locus minoris resistentiæ.*

Menstruation and Pregnancy after Operation.—Patients from whom only one ovary has been removed continue to menstruate and may become pregnant. If both ovaries are completely removed,[85] premature menopause will follow, but it may be delayed for several months. The fact that pregnancy has been known to follow the intentional resection of a portion only of one ovary after removal of the other (Schröder), as well as the persistence of menstruation after cases of so-called double ovariotomy which were evidently incomplete, prove that only a very small portion of ovarian tissue is needed to maintain the reflex influence causing menstruation. It is difficult to be certain that no trace of the ovary is left behind when removing an ovarian tumor with a short pedicle, especially if it be a papillary tumor. I discussed this question more in detail in the chapter upon Amenorrhœa.

Insanity Following Operation.—Acute mania and melancholia are more apt to follow ovariotomy than any other operation upon the female genital organs. This occurs particularly where there is hereditary predisposition to insanity, but in exceptional cases there may be no known cause. We should always try to ascertain whether alcoholism or the absorption of iodoform could account for the cerebral derangement, which, it is true, is often merely temporary (as I once witnessed in a remarkable case), but yet which may persist.[86]

Similar occurrences have been noticed after abdominal hysterectomy,[87] and even after operations on the vulva, perineum, cervix, and mammary gland.[88] In this last case, it would seem that there must be a neuropathic tendency which some determining cause would surely sooner or later develop into insanity. The surgeon, however, must bear in mind the possibility of this complication, though it be rare, and even count it as a factor in the prognosis, if he is dealing with a patient with hereditary predisposition to insanity or simply with a neurotic taint.

Cysts Complicated by Pregnancy. Ovariotomy during Pregnancy.—Under these circumstances, pregnancy and labor have sometimes been successfully terminated without surgical interference, but only in exceptional cases. As a rule, small pelvic cysts, if they do not interfere with pregnancy, are a formidable complication of labor; large abdominal cysts are almost sure to cause abortion, and run a

great chance of torsion of the pedicle, rupture, or suppuration causing peritonitis. A comparison of the dangers of expectant treatment and the relative innocuousness of timely ovariotomy will cause no hesitancy in a choice.[89] Yet the advisability of operation has been contested by some authorities; some prefer induced abortion,[90] premature labor, or even puncture of the tumor.[91] In the first two cases the obstacle interposed to the retraction of the uterus may be a cause of hemorrhage or puerperal accidents; in the last case there is danger of wounding the uterus, and abortion usually follows under unfortunate conditions.

The question assumes a different character according to whether we are called to the patient before or during labor. Before labor I do not think that there should be any hesitation in performing ovariotomy. The old statistics given by Remy[92] show that out of 67 ovariotomies performed during pregnancy there were thirteen cases of interrupted gestation and death of the patient, 22 cases of abortion followed by cure, 32 cases of labor at term with cure; in other terms, 19.4% of death of the mother, and 50% of death of the child. But the results at the present day are far more encouraging. Out of thirty-six cases operated upon by L. Tait, Spencer Wells, and Schröder, there was but one death. In the great majority of cases the life of the fœtus is protected and pregnancy continues. Olshausen mentions seven cases[93] where the gravid uterus was taken for a cyst and punctured. The majority of the operators at once performed Cæsarean section, and five of the patients recovered. Before the fifth month of pregnancy, the operation is far less serious than it is later. According to Schröder,[94] the reason for this is that the pedicle becomes shortened by the opening out of the broad ligaments. However that may be, out of twenty-one cases operated upon after that time there was only one death.[95]

Puncture is only to be resorted to when it is absolutely impossible to operate on the cyst.

During labor, forceps, version, craniotomy, and even Cæsarean section[96] have all been tried. First of all, we must make the attempt to push the tumor above the promontory by introducing the fingers into the rectum, the patient being in the genu-pectoral position. If we do not succeed in this, the cyst must be punctured through the posterior vaginal cul-de-sac (Lomer). If its contents are too thick to be evacuated by this means, it has been advised to make a large incision in the same place, to remove the irreducible cyst (usually der-

moid). Forceps are likely to tear the parts; version can rarely be performed. The choice remains between craniotomy if the fœtus is dead, and Cæsarean section if it is alive.

For my part, I should not hesitate to perform laparatomy in order to ascertain whether removal of the cyst were possible; by ovariotomy we could then remove the obstacle, and labor could go on successfully. Even if this were not possible, I do not think that Cæsarean section or Porro's operation offers greater danger to the mother than the blind and excessive violence often exerted through the natural paths,[97] and they possess the additional advantage of saving the life of the child.

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CHAPTER VIII.

SOLID TUMORS OF THE OVARY.

As a rule, we include, under the head of solid tumors of the ovary, fibroma, sarcoma, and epithelioma or carcinoma. A few writers add papilloma, enchondroma, and tubercle. I shall not follow their example. In fact I have already described the first with the papillary cysts, of which it is in reality only an appendage. Enchondroma has no real clinical existence; it is an exceedingly rare anatomical lesion (Kiwisch). As to tubercles, they are very rarely situated in the ovary, and the symptoms to which they give rise are tubercular peritonitis or pyo-salpingitis, in which the microscope reveals giant cells and bacilli; their symptomatology is easily confounded with that of other suppurative processes of the appendages, of which I have already spoken in the chapter on Cystic Oöphoro-salpingitis.

FIBROMA.—*Pathological Anatomy.*—Fibroids of the ovary are rare. These do not form circumscribed new growths, like fibroids of the uterus, but seem rather to be a kind of fibroid degeneration of the organ which is so uniformly hypertrophied that its shape and relations are not altered. Leopold[1] pointed out the fact that the tube remains free instead of becoming a part of the ovarian tumor, as is the case with cysts. Yet if the tumor opens out the broad ligament and becomes enclosed within it, this distinction disappears. We may then have great difficulty in distinguishing a fibroma originating in the ovary from one originating in the uterus which acquires the same relations.[2] Simple fibromata are usually small. It is the fibro-sarcomata[3] and fibro myxomata[4] which attain such enormous proportions. Still, Alban Doran[5] removed a fibroid of the ovarian ligament which weighed no less than seventeen pounds. Simple fibroids are hard in consistency, and have a mammillated surface; they usually have a pedicle and are free from adhesions because of the ascites which they cause. An interesting variety of fibroid, from an anatomical standpoint merely, is the fibroid of the corpus luteum described by Rokitansky:[6] it is always very small; still, Klob[7] has seen one as large as a child's head. On the section we see the denticulated folds of the corpus luteum, whose

structure can be recognized by the microscope. Ovarian fibromata are usually hollowed out into little geodes containing fluid; it is difficult to decide whether these cavities come from the Graafian follicles from limited points of molecular disintegration, or from the dilatations of lymphatics.[8] Calcification and even ossification of ovarian fibroids has been met with.[9] The structure of these tumors is chiefly fibrous in the true sense of the word; there are many connective-tissue fibres and few or no unstriped muscle fibres; if these are present to any extent, it is probable that the origin of the tumor has been misconceived, and that it is derived from the uterus. Exceptionally the vessels may be of unusual size, as in the cavernous fibromata of Spiegelberg; but in these very vascular tumors there is usually an admixture of sarcomatous tissue.

Fibroids of the ovary are met with relative frequency in young women. Leopold mentions thirteen cases at from five to thirty years of age, and only four at thirty to forty years. They are also seen in aged women. Terrier[10] removed one by laparatomy from a woman of seventy-six years.

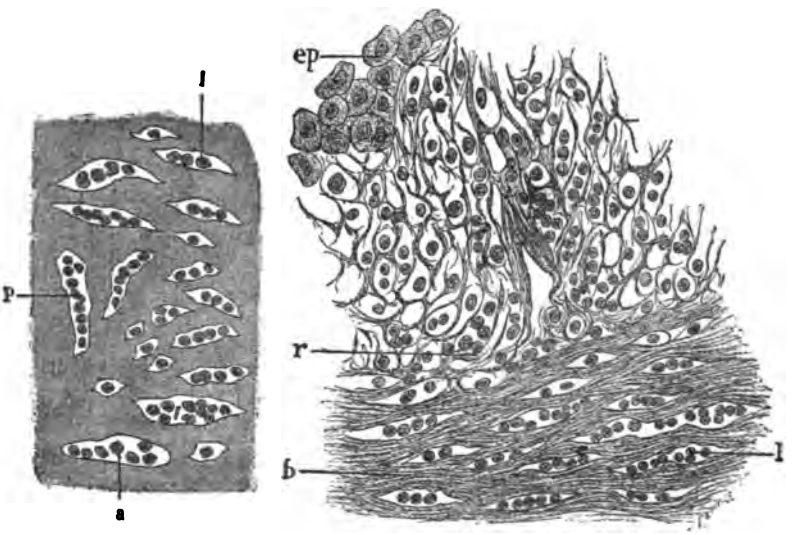
Symptoms.—Ascites is what usually attracts notice at first; it is caused by the exceeding mobility of the tumor, thus resembling ascites caused by certain pediculated fibroids of the uterus. When this symptom is absent, the tumor may escape notice, or be discovered by chance, if bimanual exploration be performed or if laparatomy be done for any other reason.

Their course is slow. Peritonitis from torsion of the pedicle has been noticed (Van Buren), as well as some cases of inflammation (Rokitansky, Kiwisch, Safford Lee).

Diagnosis.—It is almost impossible to distinguish fibroma of the ovary from a pediculated fibroid of the uterus; the ascites might also cause us to think there was a malignant tumor. Exploratory incision alone can decide the question. This is the more legitimate since the tumor must be removed in any case. The prognosis is favorable in the case of a pure fibroma, which is a benign tumor. It should, however, be removed by laparatomy as soon as it gives rise to pain, and even as soon as it is recognized, for we can never be certain that it is not a sarcoma.

SARCOMA.—*Pathological Anatomy.*—This neoplasm is of rare occurrence: according to valuable calculations based upon Schröder's ovariotomies, Cohn[11] estimates the frequency as about 1% in relation to cysts. It is usually bilateral. The spindle-celled or fibroplastic

variety is more frequent than the round-celled or embryoplastic; the first has a lardaceous consistency, the second is much softer. Cystic cavities and foci of fatty degeneration are numerous in the substance of the tissue. They contain many blood-vessels. Although usually medium-sized, they may attain an enormous volume. According to Sinéty, proliferous cysts (the mucoid epithelioma of Malassez) in which the solid element predominates have often been confounded



FIGS. 47 AND 48.—ENDOTHELIOMA OF THE OVARY (POMORSKI).

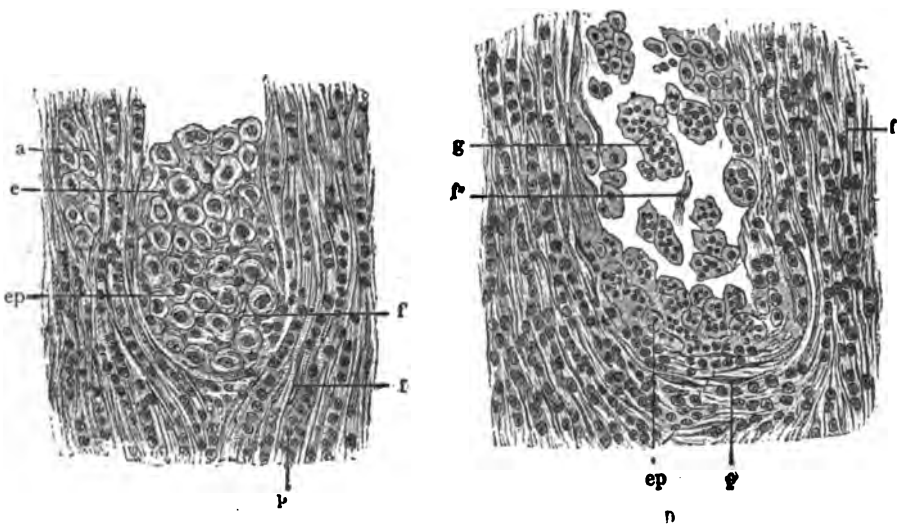
FIG. 47.—Commencing proliferation of endothelium in the lymphatic spaces. *l*, Lymphatic space with endothelial cells in the midst of an interstitial substance of the nature of connective tissue; *a*, alveolar dilatation of lymphatic space; *p*, proliferation of cells which arrange themselves like a row of beads. (Hartnack, oc. 8, ob. 7.)

FIG. 48.—Reticular modification of connective tissue under the influence of the endothelial proliferation. Same enlargement.) *l*, Lymphatic space elongated and becoming transformed into an alveolus; *b*, bundles of interstitial connective tissue; *r*, transformation of fibrous connective tissue in a reticulum; *ep*, transformation of epithelial cells into epithelioid cells; connection of the large cells with the ground substance.

with the sarcomata. Possibly the description of a mixed variety, analogous to adenoma and carcinoma (Olshausen) may be due to this confusion.[12]

While on this subject, I will speak of some researches to which the novelty of the results obtained lends interest. There has lately been described a variety of ovarian neoplasm, histologically intermediate between epithelioma and sarcoma, found in certain degenerated dermoid cysts, in papillary cysts, and in those solid tumors riddled with small cavities, which have hitherto been classed with the

sarcomata. Eckhardt[13] and Pomorski[14] called them endotheliomata to indicate their origin from the endothelium of the lymphatic spaces or capillaries, or even of the capillary blood-vessels (Eckhardt). They were able to follow step by step on the one hand the transformation of the connective-tissue elements into epithelioid cells, on the other the abundant proliferation of the endothelium of the lymphatic spaces of the connective tissue. This neoplasm is therefore a mixed variety, and shares the structure of tumors of connective-tissue origin



FIGS. 49 AND 50.—ENDOTHELIOMA OF THE OVARY (POMORSKI).

FIG. 49.—Parallel layers of connective tissue, beginning of the formation of alveoli. (Same enlargement.) *p*, Bead-like row of cells; *f*, *f'*, fusiform cells, the remains of fibrous connective tissue; *ep*, direct transformation of the tumefied cells into epithelioid cells; *e*, cell resulting from the proliferation, situated between the epithelioid cells, and not yet completely transformed; *a*, beginning stratification of connective tissue, under the influence of the cellular proliferation within a large alveolus which is in process of formation.

FIG. 50.—Alveolus. (Same enlargement.) *ep*, Direct transformation of proliferated cells into epithelioid cells; *g*, giant cell; *f'*, fusiform cells forming a partition in the interior of the alveolus; *f'*, fusiform cells in the wall of the alveolus.

or sarcoma, and tumors of epithelial origin or carcinoma[15] (Figs. 47, 48, 49, and 50). Leopold[16] was the first to point out this variety of ovarian tumor. Two other observations, analogous from a histological standpoint, although differing widely from the standpoint of the macroscopic pathological anatomy, had been published by Marchand.[17] We may even apply to this type of tumor the observations made long ago by Olshausen-Ackermann[18] and Flaischlen.[19] From the facts known, we can see that we have here to do with a curious variety of sarcoma, either primary (papillary tumor of the ovary or microcystic sarcoma)

or secondary (degeneration of the walls of a dermoid cyst). The interest attaching to these theories is great, but purely histological. From a clinical point of view, it would seem that these tumors are of great malignity. The symptoms are those of a rapidly developing malign tumor.

Their surface is smooth, and the general form of the ovary is retained; the lesion is sometimes bilateral.[20] Pregnancy sometimes stimulates it to rapid development. Munchmeyer,[21] in a case where pregnancy caused an enormous development of the tumor, was obliged to perform craniotomy. Ascites is always present, and cachexia rapidly appears. This rapid course is what clinically distinguishes sarcoma from fibroma. It is more often seen in the young than fibroma, as in epithelioma age furnishes no data for diagnosis. The only treatment is extirpation. A relapse is more to be feared than in fibroma, but is less fatal than in epithelioma. C. Braun[22] reports a well-authenticated case of ovarian sarcoma in which a cure had been maintained without relapse for eleven years.

EPITHELIOMA OR CARCINOMA.—If we exclude the secondary cancerous degeneration of cysts, primary cancer of the ovary is rare. Yet it has been noted at all ages, even in infancy.

Pathological Anatomy.—Two principal anatomical forms are described; one diffuse and medullary, the other superficial and papillary.

There is great confusion upon this last point, and many cases of ruptured papillary cysts have been given the name of cancer or of cancerous papilloma. We must, with Cohn,[23] be careful to discriminate between the vegetations distinctive of the two morbid growths, which, although they may look alike to the naked eye, are seen under the microscope to possess a structure characteristic of either carcinoma or papilloma. The diagnosis is complicated by the fact that the transition from one of these forms to the other may be clinically and anatomically indistinguishable. Epithelioma or medullary carcinoma should also, at least theoretically, be clearly distinguished from the proliferous glandular cysts with colloid and gelatiniform contents and with small cavities, which may have the same general appearance to the naked eye. Even under the microscope, an exact distinction is often difficult, because of carcinomatous degeneration of the cyst walls. In fact, we have to confess, with De Sinéty,[24] that "at this date it seems impossible for us to trace a clear line of demarcation between cysts and cancer of the ovary." But although this is absolutely true

as regards a large number of cases doubtful from an anatomical point of view, yet from a clinical standpoint we can usually make a distinction, though even here we may fall into many errors. Winter[25] has seen the Fallopian tube perforated and invaded by a cancer originating in the ovary, which distended it in such a manner as to simulate a hydro-salpinx.

The symptoms are in no wise characteristic at the onset. But before long the development of ascites, the fluid of which is often tinged with blood, the general wasting, and the extraordinarily rapid progress of the tumor emphasize its malignant character. We may see œdema of the lower limbs, thrombosis, and finally a metastatic generalization. The diagnosis is doubtful only in the first stages, when we may think that there is a fibroma or a sarcoma. The course of the disease soon settles all doubts.

As to treatment, there are two methods advocated. Some, among whom is found Schröder, in view of the small chance of recovery held out by operation, and the greater risks undergone than in the case of benign tumors, recommend abstention from operative procedures, and the administration of palliatives. Others, believing that the patient may be relieved for a while, or even temporarily cured, operate, even though complete extirpation be not possible. Spencer Wells, Gaillard Thomas, Ruge, Cohn, A. Martin, and Duvelinx[26] hold the latter opinion, in which I share. I believe with the last-named writer that when in doubt we are justified in making an exploratory incision, and that this is not as harmful as Olshausen believes. In the only two cases in which I performed it, the patients, on the contrary, had a decided diminution of the ascites for several months.

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3. Spiegelberg (Monatschr. für Geb., Band xxviii., p. 415) describes a fibroid weighing thirty kilogr. It was probably a fibro-sarcoma (Schröder). Monod (Bull. Soc. de Chirurg., Nov. 13th, 1889) removed from a woman of 50 years a fibro-sarcoma as large as a melon, accompanied by an enormous amount of ascites.

4. Martin (Traité Clin. des Mal. des Femmes, French trans., p. 590) in June, 1886, removed from one woman two ovaries which had undergone fibro-myxomatous degeneration, and which both together weighed about five pounds.

5. Alban Doran: British Med. Journal, June 8th, 1888.

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12. Seeger (Ueber solide Tumoren der Ovarien. Dissert. Inaug., Munich, 1888) describes three cases of carcinoma sarcomatosum.

13. Eckardt: Ueber endotheliale Eierstocktumoren. Zeitschr. für Geb. und Gyn., Bd. xvi., Heft 2, p. 344, 1889. The case was one of a dermoid cyst which had apparently undergone sarcomatous degeneration.

14. Pomorski: Endothelioma Ovarii. Zeitschr. f. Geb. und Gyn., Band xviii., Heft 1, p. 92, 1890.

15. The first description of tumors of this nature was given by Kolaczek: Ueber Angiosarcoma, in Zeitschr. f. Chir., Bd. ix. and xiii. He collected sixty observations published under the most widely differing names, but all possessing the common characteristic of being derived from the capillary walls, and therefore of being endothelial or perithelial productions. He called them angiosarcoma. Kolaczek's observations were almost exclusively limited to tumors of the head, which started from the forehead, cheeks and jaw; none of them relate to the ovary. Golgi (Sulla Struttura e sullo Sviluppo degli Psammomi, Pavia, 1869, reviewed in Virchow's Archiv, Bd. li., p. 311) was the first to call these tumors endothelioma. From a purely histological point of view, it is interesting to study in connection with these tumors the researches of Michel: Beitrag zur Kenntniss der sogen. Stauungspapille und der pathologischen Veränderungen in dem Raume zwischen äusserer und innerer Opticus-Scheide. Arch. f. Heilkunde, xiv., 1.

16. Leopold: Die soliden Eierstocksgeschwülste. Arch. f. Gyn., Bd. vi. He gives it the name of Lymphangioma Cystomatosum. The tumor was found at the autopsy of a little girl of eight years, and was as large as a head. Upon section, it was seen to possess a reticulated stroma studded with a great number of small cystic cavities.

17. Marchand: Beitrag zur Kenntniss der Ovarialtumoren. Abhandlung der Naturforscher-Gesellschaft, Halle, 1879, Bd. xiv., Heft 3. The first case was one of bilateral papillary tumor in a woman of 48 years; the second case, one of nodules scattered through an ovary which was half the size of an apple, met with in an inguinal hernia.

18. Olshausen: Krankheiten der Ovarien, 2d edit., p. 340. Tumor the size of a head, found during the autopsy of a young girl of 17 years. It was composed of a reticulated stroma of capillaries filled, not with blood-corpuscles, but with round cells. The meshes of the network were filled with an albuminous mass studded with nodules. Eckardt (loc. cit. [13]) considers this an example of intravascular endothelioma of the ovary, and compares it with the case studied by himself.

19. Flaischlen: Zur malignen Degeneration von Ovarialkystomen. Zeitsch. f. Geb. und Gyn., Bd. vii., p. 449. Multilocular dermoid cyst with apparently sarcomatous degeneration of the walls of the sac, in which a microscopical examination shows that the connective tissue originates in the lymphatic spaces.

20. Weinlechner presented before the Obst. and Gyn. Soc. of Vienna, March 26th, 1889, the two ovaries of a young girl of 21 years, which weighed 20 to 23 ounces and were transformed into round-celled sarcoma. Centr. f. Gyn., 1889, No. 36.

21. Munchmeyer: Gyn. Soc. of Dresden, July 4th, 1889. Centr. f. Gyn., 1890, p. 186.

22. C. Braun: Obst. and Gyn. Soc. of Vienna, March 26th, 1889. Centr. f. Gyn., 1889, No. 36.

23. Cohn: Loc. cit. (11), p. 28.

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25. Winter: Obst. and Gyn. Soc. of Berlin, June 24th, 1887, p. 497.

26. See the discussion upon this point at the Obst. and Gyn. Soc. of Berlin, November 27th, 1885, p. 9. See also above the bibliographical references in regard to the indications and contra-indications of ovariotomy.

CHAPTER IX.

TUMORS OF THE FALLOPIAN TUBES, BROAD AND ROUND LIGAMENTS.

TUMORS OF THE FALLOPIAN TUBES.[1]—FIBROIDS are rare and of small size; they develop toward the exterior, and do not as a rule diminish the calibre of the oviduct. Epithelioma or carcinoma and sarcoma, as a rule, are derived from cancer of the ovary or of the uterus. We may at times see advanced cancer of the ovary with a perfectly healthy tube. This remarkable fact is no doubt due to the direction of the lymph stream (Olshausen). Out of seventy-three cases of cancerous uteri, Kiwisch noted cancer of the tubes eighteen times, and Dittrich out of ninety-four cases of various kinds of cancer, found malignant degeneration of the oviduct four times only. This affection is therefore infrequent. Orthmann[2] collected the reports of thirteen cases, in which the uterus was nine times the starting-point of the disease and the ovary four times. In a unique case in A. Martin's clinic, the carcinoma (epithelioma) of the tube was primary; it was a cancer of papillary vegetative form in a woman of fifty-one years. I have been able to find very few additional records of authentic primary tubal cancer; another was reported by Sänger,[3] but was a sarcoma; a third, operated upon by Landau and presented by Gottschalk,[4] was also sarcoma. A fourth carcinoma or epithelioma is reported by Kaltenbach,[5] and a fifth by A. Doran.[6] The ovary and the tube in the last case were carcinomatous, but the affection of the latter was evidently primary. The patient was forty-eight years old, and for three years had had a watery and sometimes a bloody discharge from the vagina; pelvic inflammation followed curetting, which was of no benefit, and the tumor of the appendages, which had not been present before, began to develop at that time.

From the reports published it would seem that cancer of the tube appears more particularly at the menopause, and is of slow growth. It very early gives rise to a bloody discharge through the vagina, but the uterus preserves its integrity.

A. Doran[7] describes a papilloma of the tubes which he considers

benignant, and which he compares to condyloma of the vulva and vagina. He thinks that these growths are not neoplasms, but simply hyperplasiæ due to chronic inflammation of the organ. He reports two interesting cases, which, however, do not suffice to prove that these lesions form any definite clinical type. It is very probable that in this case, as in the case of ovarian papilloma, an anatomical form of identical appearance may from some unknown cause develop into either a benignant or malignant tumor. Bland Sutton, who also considers papilloma of the tube to be a special and benign anatomical form of tumor, attaches great importance to gonorrhœa as a predisposing cause. If this theory be true, it would be difficult to account for the rarity of the affection. We must be careful not to confound papilloma with foliaceous hypertrophy of the folds of tubal mucous membrane in some cases of salpingitis.

TUMORS OF THE BROAD LIGAMENTS.—The cysts have been studied with ovarian cysts, to which they belong clinically. Fibroid bodies independent of the uterus have been observed in the broad ligament. It is impossible to determine whether they are primarily developed at the expense of the prolongations of connective tissue and muscular tissue belonging to these folds or whether they are due to a migration of fibroid bodies from the uterus. Klob, Kiwisch, and Virchow[8] hold to the latter opinion; while Sänger,[9] Bilfinger,[10] and Freund have demonstrated the autogenous origin in cases upon which they operated.

Tédenat[11] observed an enormous fibro-cystic tumor accompanied by other purely fibroid tumors of the broad ligament. We must not mistake for small fibroids the accessory ovaries whose possible existence has been pointed out by Waldeyer and Beigel;[12] they are rarely as large as a cherry, and never larger.

Lipoma has rarely been observed in the broad ligament. I saw one case which had been mistaken for an ovarian cyst because of the misleading sense of fluctuation. The patient suddenly died of embolus three days after an exploratory puncture. Terrillon[13] operated upon a case in which an enormous tumor weighing sixty pounds sprang from the mesentery. The enucleation of these subserous tumors leaves a large cavity which must be treated in the manner described for intraligamental fibrous bodies of the uterus.

Epithelioma and Sarcoma.—In this situation these neoplasms result from an extension of neighboring tumors situated either in the peritoneum, the ovary, or the uterus. Bandl has seen some cases where they came from the pelvic ganglia.

Parovarian Varicocele. Phleboliths.—Varicose dilatation of the utero-ovarian veins, which was pointed out by Richet[14] and his pupil Devalz,[15] was found no less than ten times out of three hundred autopsies performed by Winckel. Their size must certainly be greater in the living subject than in the cadaver. Winckel[16] has found thrombi, and Klob and Bandl phleboliths.

Echinococci.—Freund[17] devotes an important monograph to the study of these parasites in the female pelvis; they travel about in all the cellular interstices communicating with the superior pelvi-rectal space, which seems to be their point of entrance, and may thus reach the broad ligament, pass into the iliac fossa, and pass out of the pelvis either below or above the crural arch. They cause chronic inflammation with induration of the connective tissue round about them. There may be no local symptoms outside of the pressure phenomena, and the general health is not affected. The tumors are round and elastic, situated as a usual thing near the rectum in the posterior part of the pelvis, slightly movable, not painful. With bimanual palpation we recognize the fact that they are not continuous with the uterus or ovaries. There is danger that an exploratory puncture might be followed by inflammation.

The diagnosis can only be made by exclusion and by the aid of medical geography, which teaches us the relative frequency of echinococci in certain countries, Iceland, Mecklenburg, etc. The treatment varies according to the seat of the tumor. If it be quite large and protrude into the abdomen, laparatomy will permit us either to completely enucleate the sac or to suture it to the abdominal wound, tampon and drain it. In the case of small pelvic tumors interference will be necessary only when there are accidents due to compression; then we make an incision through the posterior vaginal cul-de-sac to the tumor, or else we reach it by perineotomy or para-sacral incision, according to circumstances. If we have had to cut the peritoneum, we must, as soon as we reach the sac and before opening it, use a tamponade of iodoform gauze for twenty-four or forty-eight hours, in order to assure hæmostasis and the formation of protective adhesions; at a second *séance* we can open the sac under antiseptic precautions.

Tumors of the Round Ligaments.—*Cysts or Hydrocele.*—An accumulation of encysted serum may sometimes be seen in the interior of the inguinal canal, or at its external orifice. It was quite natural to attribute this lesion to a persistence of the canal of Nuck, which

surrounds the round ligament during intra-uterine existence. This origin, although admitted by many authorities,[18] is denied by Professor Duplay.[19] Still, Schröder[20] asserts that in a case observed by himself the fluid could be pushed into the abdomen, which certainly seems to prove the existence of a communication between the cyst and the peritoneal cavity, and an origin analogous to that of congenital hydrocele in the male. Whether this be the true origin or not, another may be claimed for it; the cyst might be seated in the substance of the round ligament. We know, in fact, that the gubernaculum of Hunter, which becomes the round ligament in the female, is, according to E. H. Weber,[21] at first hollow; there might be a persistence of a fœtal condition favoring the production of a pathological growth.[22]

I will return to the subject of the symptoms, diagnosis, and treatment, under the head of Inflammation and Cysts of Bartholin's Gland.

Fibroma.—This may occur as pure fibroma, as fibro-myoma,[23] myxo-fibroma,[24] or fibro-myxo-sarcoma.[25] Calcareous degeneration has been noticed (Duncan). Leopold found a lymphangiectatic myoma in the round ligament.

The most frequent situation is upon the right side (eight cases out of eleven, Sänger), and it usually comes after parturition. The tumor may be seated at the internal orifice, it may be intra-peritoneal (three such cases are quoted by Winckel, Duncan, and Kleinwächter), or external in the labium majus or toward the fold of the groin. Free from the skin, often pediculated but sometimes sessile, the mass, which is of varying size, is smooth or slightly lobulated, and usually of a fibrous consistency; it is not painful on pressure, but causes pain by the pressure which it exerts when it attains a certain volume. Cough and straining efforts have no effect upon fibromata. It is only at the beginning, when they are very small and externally situated, that they may be partly reduced through the inguinal canal. They have been known to increase in size under the influence of pregnancy and even at each menstrual period. The course is slow in the case of pure fibromata, but in the case of mixed tumors may assume all the rapidity of malignant growths. In regard to the diagnosis, we must, with Duplay, distinguish the cases in which there is a pedicle from those where there is none. If there is a pedicle which pushes in beneath the crural arch, it cannot be a neoplasm of the round ligament. If it pass above, the tumor may belong to the ligament or be a fatty hernia, an epiplocele, or an ovarian hernia. A differential

diagnosis may be reached by the following signs: Fatty hernia is often reduced by pressure, is painful to the touch, feels soft, and has poorly defined limits. Irreducible epiplocele, which often acquires a fibroid consistency like that of fibroma, would be impossible to distinguish, were it not for the pressure of an epiploic cord stretched behind the abdominal wall. Ovarian hernia is ovoid, having the shape of the organ, and is exquisitely sensitive to pressure; its increase in size at the menstrual period is even more marked than in certain fibroids; the uterus is laterally displaced.

If the tumor is non-pediculated and in the groin, we might think it a ganglionic mass. But in that case it would be multilobular and never especially connected with the inguinal ring. If the neoplasm is in the labium majus, we should be apt to think of a cyst of Bartholin's gland; we must ascertain its starting-point, by its history and by direct examination; if the tumor first appeared above the labium, and then entered it, and if its insertion in the external abdominal ring can be clearly felt, we need not hesitate to pronounce it a tumor of the round ligament.

The prognosis is indicated by the course of the disease.

The treatment is extirpation; it is usually easy to enucleate fibromata when they are situated at the external ring. The ones which are periperitoneal, behind the internal abdominal ring, and of large size, may necessitate a serious operation for their removal.

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3. Sänger: Centr. f. Gyn., 1888, p. 601.

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8. Virchow: Traité des Tumeurs, vol. iii.

9. Sänger: Ueber primäre desmoide Geschwülste der Lig. lata. Arch. f. Gyn., Bd. xvi., Heft 2, and Bd. xx., p. 279.

10. Bilfinger: Ein Beitrag zur Kenntniss der primären desmoiden Geschwülste in den breiten Mutterbändern. Dissert. Inaug., Würzburg, 1887. He reports a case of a fibroma the size of a goose egg, found at the autopsy of a womon of 56

years, the primary origin of which cannot be doubted. The writer adds a table of the thirteen cases of this lesion known up to the present time.

11. Professor Tédenat, of Montpellier, has kindly sent me the following observation hitherto unpublished. "Fibro-myoma of the broad ligament weighing seven kilograms after evacuation of a cysto-myoma containing eight quarts of fluid; uterus normal. Patient 48 years old, the mother of two children. The abdomen began to increase in size seven years before; menstruation regular, scanty; constipation obstinate; lumbar pains. For two years past the enormous size of the tumor has interfered with respiration. At the examination a large fluctuating tumor was found, connected to a small and mobile uterus in the usual manner of ovarian cysts. In the cul-de-sac of Douglas small mobile masses could be felt. Laparatomy. Difficult removal of the tumors of the uterus and appendages; the fibro-myomata adhering to the pelvic walls; abundant hemorrhage; death at the end of twenty hours. The cysto-myoma in the broad ligament of the right side spreads to the right and in front of the uterus; it contains eight quarts of fluid; its wall, which is from one-half to two and a half inches in thickness, is of a pinkish tinge on the external surface, red, reticulated, and lobulated on the internal surface. From its postero-external surface is suspended a flask-shaped growth of a pale pink color, as large as two fists, and having a pedicle one and a half inches long and one and a half inches thick. Behind these two larger masses are about ten tumors of various sizes (hen's egg, fist, large pear, kidney) included within the broad ligaments, and bound together by loose connnective tisssue which leaves them very mobile. They are not continuous with the uterus, which is small and normal. These tumors are typical fibro-myomata, originating in the broad ligament, and of looser texture than the ordinary uterine myomata."

12. Waldeyer: Eierstock und Ei. Beigel: Ueber accessorische Ovarien. Wiener med. Wochenschr., 1887, No. 12.

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15. Devalz: Thèse de Paris, 1858.

16. Winckel: Lehrbuch der Frauenkr., 1886.

17. W. A. Freund: Gynäkol. Klin. Die Echinococcen-Krankheit im weiblichen Becken, 1885, p. 299. See also Davaine: Traité des Entozoaires. Charcot: Mém. de la Soc. de Biol., 1852, vol. iv. Villard: Annales de Gyn., vol. ix., p. 118.

18. Zuckerkandl (Langenbeck's Archiv, Bd. xxi., p. 215) claims to have found the canal of Nuck four times out of nineteen autopsies upon little girls of one to twelve years of age; three times it was bilateral.

19. Duplay: Des Collections Séreuses et Hydatique de l'Aine, Paris, 1885, and Traité de Path. Externe, vol. vii., p. 721, 1887.

20. Schröder: Mal. des. Org. Gén. de la Femme, Fr. Ed., p. 455.

21. E. H. Weber, quoted by Bandl and by Schröder: Loc. cit.

22. Consult upon the genesis of these cysts, Staffel: Ueber Cysten der Canales Nuckii. Centr. f. Gyn., 1888, p. 273.

23. Winckel: Loc. cit. (16), p. 700.

24. Duplay: Contrib. à l'Étude des Tumeurs du Ligament Rond. Archiv Génér. de Méd., March, 1882.

25. Sänger: Archiv f. Gynäk., xxi., p. 279.

CHAPTER X.

GENITAL AND PERITONEAL TUBERCULOSIS.

THE invasion of the genital apparatus by the tubercle bacillus is rather rare. Certain localities, as the vagina and the cervix, seem to possess slight susceptibility to it, probably because of the protection afforded by the resistant stratified epithelium. The Fallopian tubes are usually the starting-point of the tuberculous lesions; and from them the disease is easily transmitted to the ovaries, or more rarely to the uterus itself. I shall give a description of tuberculosis of the genital organs according to their anatomical order.

Historical Outline.—The works of Louis, Senn, Raynaud, and Cruveilhier mark the first stage in the study of this subject. With the added researches of Aran, Bernutz, and especially Brouardel,[1] the pathological anatomy, although still placing too much emphasis upon macroscopical appearances, began to be more accurate and the clinical knowledge more exact. Since that time, the discovery of tuberculous glands and then of Koch's bacillus, have given a certain criterion for research, while the increasing boldness of surgeons affords better opportunity for the study of fresh specimens. The names of Hegar, Wiedow, Cornil, and Terrillon[2] are conspicuous among the more recent works upon the pathological anatomy and treatment of the disease.

In regard to the pathogenesis, we may mention Cohnheim,[3] who was the first to suggest the idea of a possible transmission of the disease through sexual intercourse; Verneuil,[4] who vigorously upheld this thecry, and showed the utility of confronting the inoculated person with the inoculator—a method which materially aided the progress of the etiology of syphilitic diseases; Verchère,[5] a pupil of Verneuil, Fernet, and Derville,[6] who reported cases of very probable genital infection; and Réclus,[7] who discussed them.

Etiology. Pathogenesis.—Can there be primary genital tuberculosis? Undoubtedly there can. Geil[8] and Tomlinson,[9] systematizing the previously announced theories of Namias,[10] Cristoforis,[11] and Rokitansky,[12] long ago quoted numerous examples of isolated tuberculosis of the appendages. It is true that observations made before

the discovery of the tuberculous glands and the special bacillus were not of decided importance. But later investigations have quite established the fact.[13]

Primary tuberculosis of the genital organs is not infrequent in the male.[14] One of the peculiarities of this species of local tuberculosis in both sexes is the possibility of its remaining latent and unrecognized for an indefinite period, because of its sequestration by false membranes and by the inspissation of pus. This is especially observed where the lesion is in the tubes, and it may even be impossible to find the bacilli, which have doubtless been destroyed during the long continuance, although the tubercular nature of the focus of the disease is shown by the sudden appearance of an acute miliary eruption, either in the lungs or the meninges. The history of old foci of tuberculous affection in the bones or articulations furnish many analogous examples.

How is the tubercle bacillus introduced into the female genital organs? The external communications of these organs would seem to admit, *à priori*, of their frequent infection either through the atmosphere, the introduction of infectious bodies or of tuberculous semen. This theory was inadmissible before the researches of Villemin and Koch had overturned all preconceived notions of the origin of tuberculosis. Even now this theory of direct infection is not received without dispute by all authorities. It has had over-ardent advocates, who were ready to accept it in some doubtful cases without sufficient proof, and also some opponents who systematically disparaged it. It seems probable that this method of infection may occur, but it assuredly is rare.

The frequency of primary tuberculosis as compared with secondary has been a subject of research. Mosler[15] found eight primary cases out of forty-six observations. Frerichs[16] gives a proportion of fifteen out of ninety-six, and Schram[17] only one in thirty-four.

We can easily trace the infective agents in primary tuberculosis when the patients have been much in the company of any one suffering from tuberculosis; clothes, a sound, the finger of a physician or midwife, may carry the germs. Cohabitation with a person who has either genital or pulmonary tuberculosis is a well-authenticated cause in many instances.[18] We may make a distinction, from this standpoint, between the cases where the individual giving the infection has tubercles on the genital organs and those where other organs only have tubercles. In the first case we may readily admit that the

semen may contain bacilli. Cornil and Babès have in fact found bacilli in the urine of persons affected with tubercular cystitis; Rosenstein made the same observation in a patient who had only a caseous epididymitis. We may, then, in the absence of a positive examination of the semen, suppose that it has become infected in crossing the urethra. We still have to account for the cases where there seemed to be direct infection from a man whose lungs only were affected. The virulence of the semen rests then only upon hypotheses; and the experiments of Landouzy and Martin[19] show, in truth, that we may meet with a few bacilli in the testicles and prostate gland of phthisical patients whose genital organs are apparently healthy. But it is almost certain that these bacilli are imprisoned within the capillary blood-vessels, and we have no authority for believing that they can escape through the membranes into the secretions. Grawitz, to be sure, proved the passage of the corpuscles and the mould germs (which are larger than the bacilli) through the epithelium of the glomeruli of the normal kidney; still, reasoning by analogy has never any but a theoretical value. Does the infection in these cases come through the semen, the saliva, or the blood of a scratch? A positive answer cannot be given. The puerperal state has a large share in primary infection; this fact is admitted by all writers. The genital tract is then open to the entrance of all morbid germs, and obstetrical manœuvres themselves may assist in their introduction. We must, moreover, remember that infection of any kind, septicæmic or blennorrhagic, predisposes to the bacillary infection. We know how the puerperal state predisposes to the first two infections; they in their turn pave the way for the third. General pathology describes these occurrences under the name of mixed or combined infection (Mischinfection of the Germans).

Secondary genital tuberculosis, that which is developed in the course of tubercular degeneration of other organs, especially the lungs, is much more frequent than primary tuberculosis. Before deciding that the infection is primary, we must be quite sure that there is not the least tubercular nodule at the apex of the lungs, and we know how difficult this is to determine. This constitutes the weak point of many so-called conclusive demonstrations which have been published; another weak point is the too great readiness to assert the tuberculous nature of small indurations of the epididymis or the prostate gland in persons supposed to be the source of the contamination; in many cases I think this is simply begging the question.

Tuberculosis of the genital organs, occurring in the course of phthisis, although one with it from an etiological point of view, is divided into two varieties from the standpoint of pathogenesis. In the great majority of cases, no doubt, the genital tuberculosis is secondary and metastatic, according to Conheim's expression, and the microbe has travelled in the blood or the lymph. At other times infection is produced by another process, which resembles that of the primary infection of non-tuberculous individuals; we might almost call it primary-secondary infection. The patient then contaminates the genital organs through the intermediary of the external medium, which she has herself infected.

When a patient in advanced phthisis develops ulcerations on the vagina, they are probably caused by linen soiled with her diarrhœal discharges or sputum.[20] Finally, the inoculation of tuberculosis may be accomplished by continuity, by contact or propagation through the lymphatics, where there is an intestinal tuberculosis which has infected the pelvic ganglia. Bacilli in the peritoneal cavity may infect the fimbriated end of the Fallopian tube. Pinner[21] has shown that dust introduced into the peritoneal cavity is rapidly taken into the tube and conducted into the uterus; it must be the same with germs, and, in fact, Jans,[22] in a case of pulmonary and intestinal phthisis, found numerous bacilli in the sections of perfectly healthy tubes; there is no doubt that they came from the peritoneal cavity, to which they may have travelled from the intestines. The tube may also be infected by the adhesion of a loop of tuberculous intestine, just as a tuberculous recto-vaginal fistula may follow perforation of the wall in cases of ulceration of the large intestine.

The predilection shown by tubercular lesions for the tubes may be accounted for in several ways; their mucous lining, which has many folds and is not subjected to the menstrual sloughing like that of the uterus, forms an admirable resting-place for the morbific germs which reach it. The intense vitality of the uterine mucous membrane, and its partial desquamation at the monthly period, no doubt form its principal defence against the bacilli; as to the vagina, it is protected by its thick layer of stratified epithelium, and perhaps also by the struggle for existence between the bacilli and the numerous other germs to which it always affords a lodging.

As Verneuil well observes, there is no comparison possible between the conditions of proliferation of the bacillus, which is anaerobic and develops best when deeply situated, and other microbes which, like

the gonococcus, attack the first part of the genital canal with which they come in contact.

TUBERCULOSIS OF THE VULVA, VAGINA, AND CERVIX.—*Pathological Anatomy.*—Tuberculous ulceration of the vulva is a quite exceptional lesion. M. Zweigbaum,[23] who describes a case, finds only two in the annals of science. His patient, thirty-two years of age, was phthisical, and succumbed to pulmonary and intestinal tuberculosis; the writer, however, believes that the genital lesion was primary. There were also ulcerations upon the vagina and cervix.

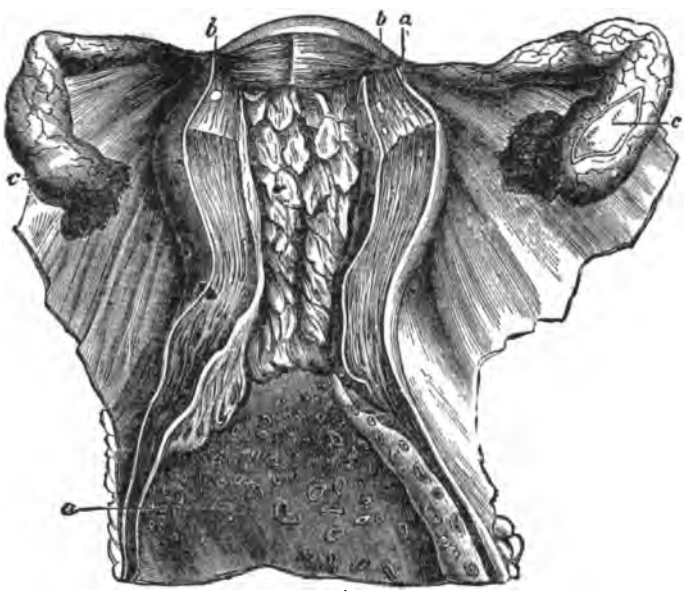

FIG. 51. TUBERCULOSIS OF THE UTERUS, VAGINA, AND TUBES (BARNES). *a*, *b*, Tuberculous masses of the mucous membrane and uterine tissue; *c*, tubes transformed into a pyo-salpinx; *d*, ulcerations of the vagina.

Bacilli in abundance were found in a small flap excised during life from the seat of the vulvar ulceration.

Tubercular lesions of the vagina or vaginal portion of the cervix are rare. Daurios[24] collected the records of twenty-four cases, but it must be acknowledged that some of them are not above criticism; external appearances or presumptions drawn from various circumstances are not enough to characterize the affection. A certain number of incontestable facts do, however, exist.

We need merely mention miliary tubercles, which may be met with in acute tuberculosis. We must also take special note of the

primary or secondary tuberculization of certain fistulæ between the vagina and the hollow organs in its neighborhood.

I found only one case of the isolated primary ulceration of the vagina observed by Max Bierfreund.[25] As a usual thing, this lesion coexists with primary affections of the tubes or uterus.[26] In a remarkable case of Virchow's[27] there was tuberculosis of the urinary tract, and the vagina was infected through the urine. The rectum may also be the starting-point of infection.

Tuberculous ulcers of the vagina have perpendicular walls, which are unequal and irregular, have a depressed yellowish-gray base, covered by a characteristic caseous coating. Around the ulceration are frequently seen small, yellow, opaque grain-like bodies, absolutely similar to those surrounding tubercular ulceration of the tongue so

FIG. 52.—TUBERCLE BACILLI. *A*, Sputum of phthisis; there are two granular leucocytes and bacilli; *B*, pure culture of Koch's bacilli.

well described by Trélat. The Koch bacilli found upon the surface of these ulcerations or in the vaginal secretions leave no doubt as to the nature of the lesion when they can be demonstrated, which is not always the case.

These tuberculous ulcerations are temporarily cured by simple methods, as applications of the tincture of iodine or lactic acid, but they soon return, for with a superficial affection of the cervix we may find tuberculous follicles invading the muscular layers.

Tuberculous fistulæ of the vagina, according to Daurios,[28] may be vesico-, urethro-, or recto-vaginal. They have nothing to distinguish them from ordinary fistulæ of the same region. The presence alone of tubercular follicles or of the bacilli around their orifice will allow of a diagnosis of their special character.

The observations of tubercles limited to the cervix are few in num-

ber, yet one case is reported by A. Laboulbène.[29] Another was described at length by Cornil;[30] it deserves to be quoted as a remarkable type of this rare lesion. I will borrow the eminent professor's description.

The case was one in which Péan had performed complete hysterec-

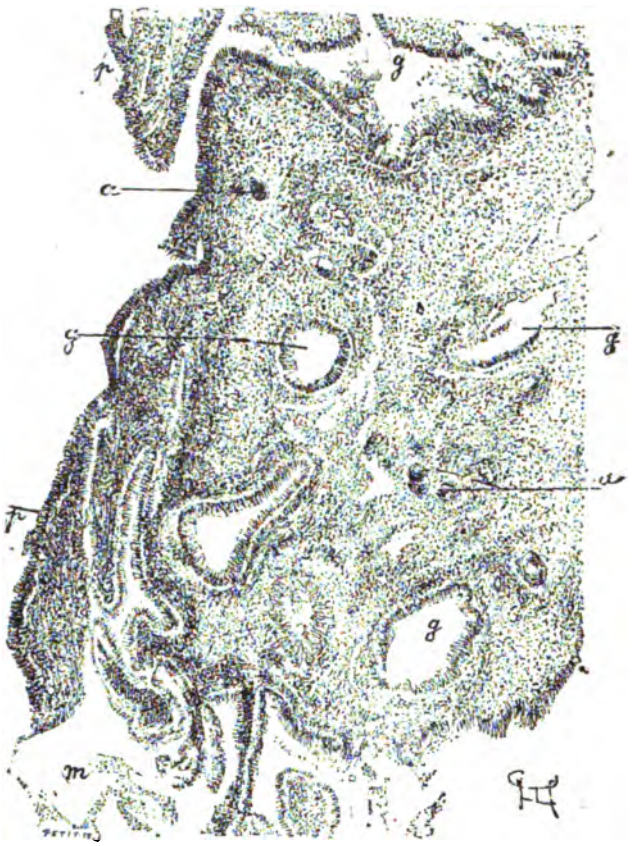

FIG. 58.—TUBERCULOSIS OF THE CERVIX UTERI. Section of the surface of the mucous membrane of the cavity of the cervix. (Mag. 30 diam.) *m*, Mucus upon the mucous membrane and in the depressions between the folds of the *arbor vitæ*; *p*, folds of the *arbor vitæ* and villi covered with columnar epithelium; *g*, *g*, *g*, glands and depressions between the folds of the *arbor vitæ*; *a*, *a*, *a*, giant cells situated in the connective tissue of the mucous membrane, surrounded by microscopic tubercular follicles (Cornil).

tomy. The clinical diagnosis of the lesion was uncertain. The appearance of the hypertrophied cervix, which was indurated, covered with irregular vegetations, bathed in a thick, yellow, grumous fluid, suggested cancer, and on this hypothesis Péan removed the uterus. "The opening of the cervical cavity showed that the folds of the arbor vitæ were very pronounced, vegetating, agglutinated together

by sticky mucus, studded with opaque clots. A histological examination showed that it was a case of tuberculosis of the cervix of the uterus limited to that part of the organ. This specimen is very in-

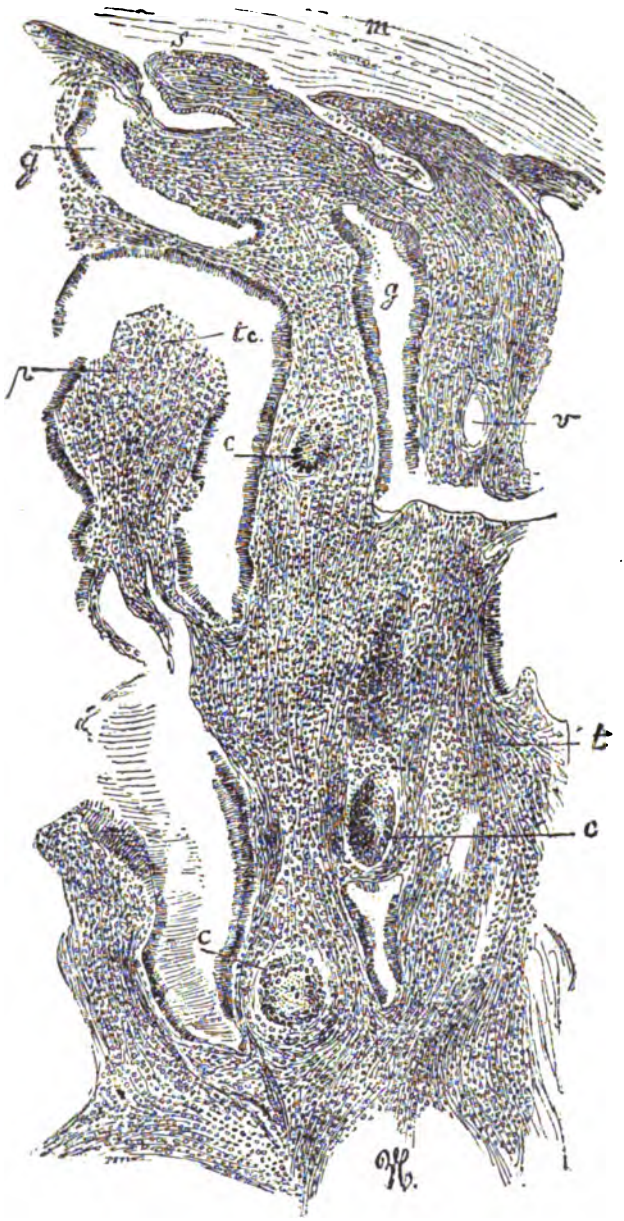

FIG. 54.—TUBERCULOSIS OF THE CERVIX UTERI. Same section as in the preceding figure, enlarged. (Mag. 100 diam.) *m*, Mucus; *s*, surface of villi and papillæ; *g*, mucus glands covered with columnar epithelium; *v*, vessel; *c*, *c*, *c*, giant cells in the inflamed connective tissue; *p*, a papilla partly covered by its epithelial layer, whose connective tissue *tc* is inflamed and shows numerous small cells (Cornil).

teresting because of its rarity, and the limitation of the tubercular process. The preparations obtained by sections perpendicular to the surface of the mucous membrane, made after hardening in alcohol, show, under a low power (Fig. 53), that the folds of the arbor vitæ have secondary villosities, and are separated by deep depressions, into which open the utricular or compound glands of the cervix. The surface of the mucous membrane, as well as the depressions and glandular cavities, are lined and filled with mucus. The glandular

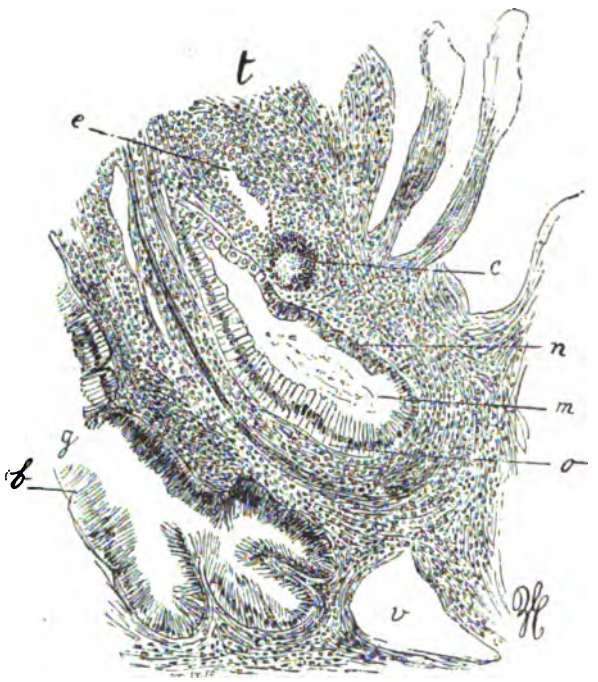

FIG. 55.—TUBERCULOSIS OF THE CERVIX UTERI. Same section as in the preceding figures, still further enlarged. (Mag. 150 diam.) *p*, Papillæ and superficial vegetations; *t*, connective tissue containing many round cells; *e*, fissure in tuberculous tissue, in which may be seen epithelioid cells belonging to a tubercular follicle; *c*, giant cells; *n*, epithelial covering of a gland near a tubercular follicle, showing large epithelial cells; *o*, epithelial layer formed of elongated cells; *m*, mucus contained in the gland; *b*, greatly elongated epithelial cells of a gland; *v*, vessel (Cornil).

cavities are enlarged and the connective tissue is filled with small cells. In this connective tissue on the surface of the mucosa, at the top of the folds of the arbor vitæ, in the superficial layers as well as deeper in between the glands, we distinguish giant cells large enough to be seen under this low power. The surface of the mucous membrane, the base of its folds and of its villi, as well as the cavity of the glands, are covered with elongated columnar cells. Under a higher power (Figs. 54 and 55) we see between the glands and in the con-

nective tissue of the mucous membrane an infiltration of small cells, and characteristic giant cells, which seem of themselves to form the whole tubercular lesion. It is true that the connective tissue surrounding them is richer in round cells than when in a normal condition; still, it contains many of these physiologically, and endometritis of the cervix will give rise to as many as tuberculosis. Moreover, as a usual thing, around the giant cells there is no agglomeration of epithelioid cells, nor any accumulation of cells undergoing granular or necrotic degeneration, from which it follows that the tuberculous follicles observed in this case, at an early stage of development, were not visible to the naked eye."

Tuberculous growths developed on the surface of the mucous membrane which covers the outer surface of the external os, that is to say, its vaginal portion, which is covered with pavement epithelium, show, in this case, the same appearance as tubercles of the pharyngeal mucous membrane; in fact, tuberculous follicles are situated on the surface of the mucous chorion. We can see giant cells in the midst of a collection of small cells; these granulations are, at their start and for a long time, covered by the normal layers of stratified pavement epithelium. Below the mucous membrane, we find a small number of tuberculous follicles, situated in the midst of crossed muscular bundles. These muscular bundles are at a given point, separated by embryonal connective tissue, which forms an island in the midst of which are one or several giant cells surrounded by epithelioid cells. These tuberculous granulations are larger than those situated upon the surface of the mucous membrane, where they are arranged in a manner quite similar to those seen in the muscular coat of the intestines, or in the lingual muscle; that is to say, they are developed in the interfascicular connective tissue, and by their growth push away the muscular fibres at their periphery. Even when we have to do with a tuberculous eruption which is slight, superficial, and of recent date, and which has caused no ulceration nor loss of substance, we must expect to find the deeper layers of the mucous membrane and even the muscular layer invaded by a few tuberculous granulations. These, which are not numerous, follow the course of the vessels in the intermuscular connective-tissue spaces.

When even in recently developed tuberculosis a histological examination shows this deep extension of the tubercular process, we may make up our minds that the physician must do more than to treat it superficially by applications or even by curetting, and that

oftentimes total removal of the organ is the only method of destroying the affected portions of the uterus.

Cornil has vainly tried to discover the tubercle bacilli in this characteristic lesion; he has found them neither in the giant cells, the follicles, nor in the mucus filling the glands and covering the surface of the mucous membrane. But the inoculation of guinea pigs with virus from this lesion gives rise to bacillary tuberculosis.

Winter,[31] on the other hand, found bacilli in the giant cells, upon flaps of mucous membrane from the body of the uterus and from the cervix. The case was that of a young tuberculous woman, upon whom Schröder had, five and a half years previously, performed laparatomy, followed by the introduction of iodoform into the abdomen for tubercular peritonitis, with such success that the ascites did not return, and the patient made a perfect recovery. After a long respite, however, tuberculosis was manifested in the lungs and the genital apparatus; the tubes were affected as well as the uterus.

Tubercular lesions cause a marked cervical endometritis. These inflammatory troubles affect the surface epithelium, the glands, and the corium.

By comparing the preceding description with that of the first stages of tubal tuberculosis, which I shall describe later, borrowing from Cornil,[32] we shall see that there is the closest analogy between affections of the cavity of the cervix and those of the tubal mucosa. We find the same disposition of giant cells at the top of the folds and villi, or in the connective tissue of these folds, the same inflammatory phenomena, the same mucous secretion, and the same modification of epithelial cells.

It is very possible that the inoculation of tuberculosis may occur by simple contact without erosion or solution of continuity of the cervical mucous membrane. At least that is what happens in the guinea pig, as shown by Cornil and Dobroklonsky's[33] experiments; but we have, of course, to be cautious in applying such examples to the human species. The diagnosis of tuberculous ulceration of the vulva, vagina, or cervix can be definitely made only in cases where there is a coexistent and advanced pulmonary disease. The discovery of tuberculous follicles and, above all, of bacilli upon a fragment obtained by curetting or excision is alone pathognomonic; still, a negative result would not justify us in asserting the absence of tuberculosis. In the case of primary genital lesions, we run a great risk of confounding them with some disease of more frequent occurrence. In a case of beginning

ulceration of the cervix, Péan believed that he was dealing with cancer, but after hysterectomy it was recognized as tuberculosis.

The treatment should be palliative in cases of advanced phthisis, energetic in all others. The ulcerations are to be cauterized with the red-hot iron and dressed with iodoform. Fistulæ are to be freely incised; we should not hesitate to perform hysterectomy for even a circumscribed ulceration of the cervix, providing that there is no doubt as to the diagnosis.

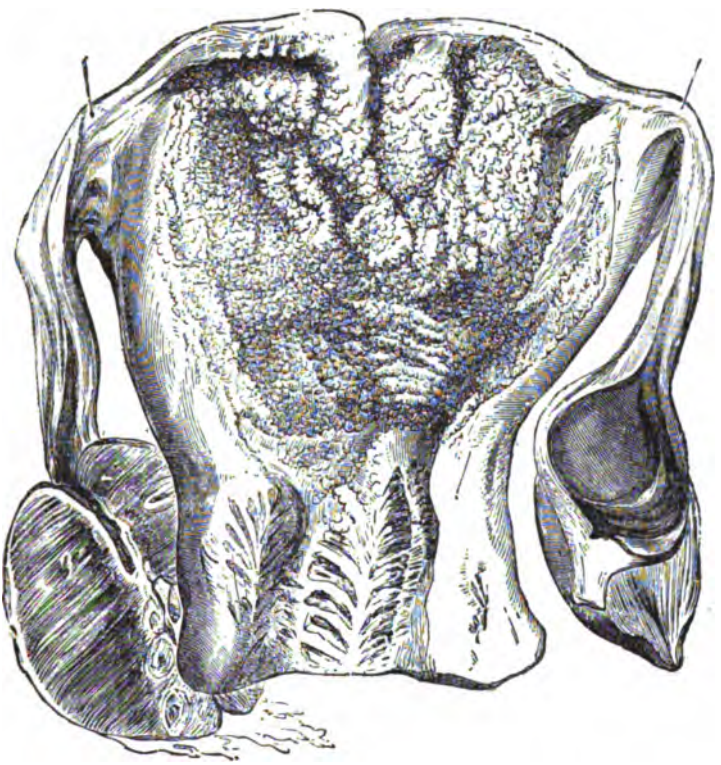

FIG. 56.—TUBERCULOSIS OF THE UTERUS AND TUBES (BARNES). The uterus is cut open; its internal surface is seen to be covered with cheesy matter; the cervix is healthy.

TUBERCULOSIS OF THE UTERUS.—*Pathological Anatomy.*—In the uterus, the disease is usually secondary. Three varieties have rather theoretically been pointed out: 1st, an acute miliary form, which is rare, which possesses no clinical interest, and which is merely an epiphenomenon in the course of a general systemic infection, with predominance of the general symptoms; 2d, an interstitial variety of slow development, essentially chronic, and equally rare, the diagnosis of which is impossible, but which may be suddenly manifested by

some grave accident, as rupture of the uterus by interference with labor, etc., resulting from the degeneration of the uterine tissue, and the impediment to the physiological functions of this organ caused by the interstitial tubercles; 3d, an ulcerous form, the most frequent and most important. In this last variety, the lesions at first resemble those of endometritis, plus giant cells containing bacilli. Later, the tuberculous follicles become confluent and the whole mucous membrane is infiltrated with a tissue formed of small cells; it then undergoes complete caseous degeneration and is yellow and opaque for about one-thirty-second to one-sixteenth of an inch; the muscular tissue beneath is often hypertrophied. With the naked eye we are unable to distinguish, either upon the surface of the mucous membrane or in a section of it, any tuberculous granulation at all resembling the classical description of miliary tuberculosis of serous membranes. The cavity of the uterus is often filled with a thick, curdy magma. It may be transformed into a pus sac by the obliteration of the os.[34]

As a usual thing, the lesion is sharply limited to the lower portion of the cervix, the upper portion remaining intact; this limitation may be marked by an ulceration which looks as though it had been made with a punch. Here is Cornil's[35] description of the changes shown by a microscopical examination of a beautiful specimen of uterine tuberculosis:

"Sections perpendicular to the surface of the mucous membrane of the body of the uterus, after hardening in alcohol, showed no vestige of normal structure; neither epithelium, nor glands, nor blood-vessels were recognizable. The whole cheesy surface, under the microscope, was seen to consist of a homogeneous layer formed of small necrosed cells, which were vitreous, and no longer susceptible of staining; their nuclei were stained a faint rose color by picro-carmine. The cells were separated by their fibrillæ, which were crossed and interlaced in every direction.

"Beneath this necrotic mass was a zone containing small living cells and occasional giant cells. Next came the muscular layer, in which were seen a few tubercular follicles. A complete section of the uterine walls, including the peritoneum, showed, therefore, an inner layer of cheesy infiltration replacing the mucous membrane, a few tubercular follicles situated in the muscular wall, and granulations in the peritoneum. In ten sections of this degenerated uterine mucous membrane I have been unable to find any tubercle bacilli."

The caseous infiltration, accompanied by superficial mortification

whose detached products form the clots of cheesy pus which fill the body of the uterus, is the most characteristic feature of chronic tuberculosis. Cornil compares this lesion to one of the same nature found in the renal pelvis and calyces, and the ureters. "This resemblance is obvious. In the body of the uterus, as in the urinary tract, we have an opaque yellow thickening with induration of a completely necrotic mucous membrane whose surface disintegrates into molecular fragments which become mixed with the pus and give the clotted aspect to which we have referred. Under the microscope, there is the same appearance; the more or less thickened layer of cheesy matter is homogenous, and uniformly infiltrated with small cells, without any distinct tuberculous foci. We are scarcely able to distinguish here and there a giant cell in the deeper and still living layers. In chronic tuberculosis, with caseous infiltration of the ureters and renal pelvis, it is equally difficult to find one or two bacilli. From what we have said in regard to the pathological anatomy of tubercular infection of the tubes and uterus, it follows that we do not find, in either a recent or a chronic state, tuberculous granulations which are perceptible to the naked eye, or even with the microscope, which resemble the classical description of tubercles. As a matter of fact, granulation of serous membranes has been taken as the type, and this type is but rarely met with in affections of the genital mucous membranes."

We should not be surprised at the infrequency with which bacilli are found in uterine tuberculosis. They are certainly present, but, as in the majority of cases of local tuberculosis (tubercles of the testicle, lupus, etc.), they are few in number, probably because the lesions are of long standing. E. Doyen, of Rheims, lately found some at the autopsy of a young woman who had died of puerperal fever, who also had tubercles of the uterine mucous membrane and muscular layer.

The symptoms at the onset are those of ordinary endometritis, with a more pronounced increase of size of the organ; this affection, which is perhaps more frequent than is usually supposed,[86] may often be unperceived. The cheesy nature of the secretions and the coexistence of other lesions in the tubes and in the lungs, should make us search for the granulations and bacilli which are alone characteristic of the disease. Yet the histological diagnosis presents many difficulties; we must not expect to find in the uterine mucous membrane tuberculous follicles similar to those met with in the serous membranes (Cornil). Moreover, the elemental granulation of Virchow,

which is the only constant lesion in tuberculosis, may be difficult to differentiate from a stroma very rich in the same elements and sometimes entirely composed of them; finally, the presence of the giant cell, which certain writers claim is to be found in interstitial endometritis, is not enough to warrant a positive diagnosis. According to Paul Petit, the tuberculous nature of endometritis may be absolutely determined if the specimens of scrapings of the *débris* possess the following characteristics: Interstitial cells which are necrosed or atrophied in a diffused manner or in well-defined lines; giant cells in greater or less number; embryonal nodules detached from the stroma and apparently developed around the vessels whose lumina may or may not be preserved; numerous flexible and dilated glands, lined with epithelial cells which are either considerably elongated or which have undergone an epithelioid transformation. In order to clear the diagnosis, we should always perform an exploratory curetting, which will prevent confusion with cancer of the body of the uterus.

The search for bacilli in the sections demands much time, and is often fruitless in spite of care and experience. The sections should be very thin and not large. The various modifications of Erlich's method may be tried, for a description of which see the special pamphlets on the subject, or the following process may be applied: The section is immersed for half a minute in picro-carmine, and one minute in a 70% solution of alcohol in which there is 0.75% of hydrochloric acid, or it may be left for twenty-four hours in Erlich's solution of methyl violet, then for a few seconds in an alkaline solution of 1% nitric acid; it is then dried and mounted in balsam. If the microscopical examination is without result, according to Cornil, we should sow some of the uterine fluid in a tube of glycerin jelly, or, better yet, inoculate it into the peritoneal cavity of a guinea pig. According to Daurios, after twelve days the animal may be opened and the result of the experiment noted.[37]

Treatment.—If the condition of the lungs permit of a radical operation, vaginal hysterectomy[38] should be performed, instead of causing useless delay by curetting, which is usually inefficient. If the uterus is large, and the tubes present suspicious signs, we should not hesitate to remove these organs by laparatomy; we can do a supra-vaginal hysterectomy if the cervix is intact, and a total hysterectomy if it is affected.

TUBERCULOSIS OF THE OVARIES AND TUBES.—*Pathological Anatomy.*—The ovaries are rarely implicated alone; a few such cases are,

however, given by Klob [39] and Spencer Wells; [40] lesions of the tubes are, on the contrary, very frequent. Terrillon [41] has seen simultaneous lesions of the tubes and ovaries three times out of six. Tubal lesions have also been noted in the greater number of cases of tuberculous endometritis, and they no doubt form the original source of the infection.[42] With the naked eye, we can perceive lesions that greatly resemble those of suppurating salpingitis, with or without cystic dilatation. The pyo-salpinx may be extensive, and possess a capacity of two quarts.[43] The formation of adhesions and its diffusion toward neighboring parts transform it into pelvic abscess (Fig. 57).

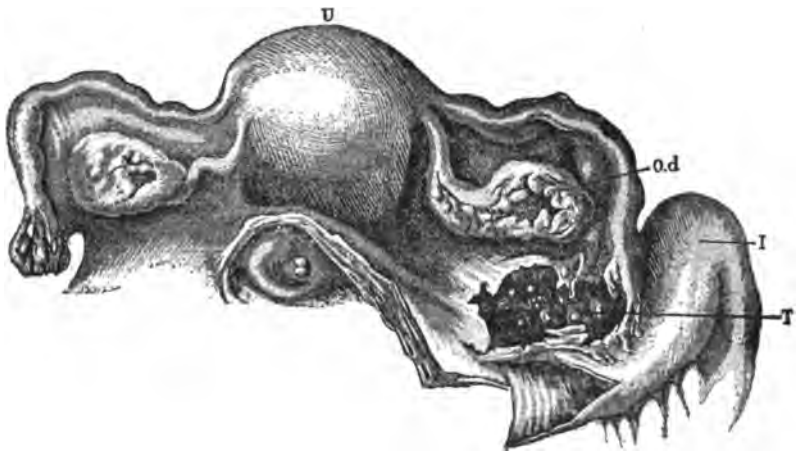

FIG. 57.—PRIMARY TUBERCULOSIS OF TUBES AND OVARIES. *U*, posterior surface of the uterus; in the posterior lip of the cervix are two small mucous cysts; *O.d*, right ovary enclosing softened caseous masses which have been evacuated by the tearing apart of the adhesions; *T*, right tube, which is dilated and adherent, and forms part of a tuberculous pelvic abscess which is limited by the intestinal loop of the ileum. The left ovary and tube are tuberculous, as is the uterine mucous membrane. There was tuberculosis (secondary?) of the right lung (Kotschau).

Of however recent date may be the lesion, it soon invades the peritoneum, and causes the formation of false membranes, and the serous encysted effusions of perimetro-salpingitis. Fernet [44] has even found progressive invasion of the pleura, and the production of subacute peritoneo-pleural tuberculosis whose starting-point is a primary lesion of the genital organs. The infection is carried through the lymphatics, which Hegar once found to contain cheesy matter. The lymphatic communications between the pleura and the peritoneum through the diaphragm account for the infection. The mesenteric glands are often degenerated.

The tubercles of the tube, whether primary or secondary to granulations in the peritoneal cavity, are recognizable to the naked eye by

the increased size of the organ, by the semi-transparent or yellow granulations upon its surface or in its muscular walls, and by its contents. Upon opening the tube longitudinally, we can see that it is dilated, that the thickened walls have tuberculous spots usually visible to the naked eye, and that it contains fluid which is more or less

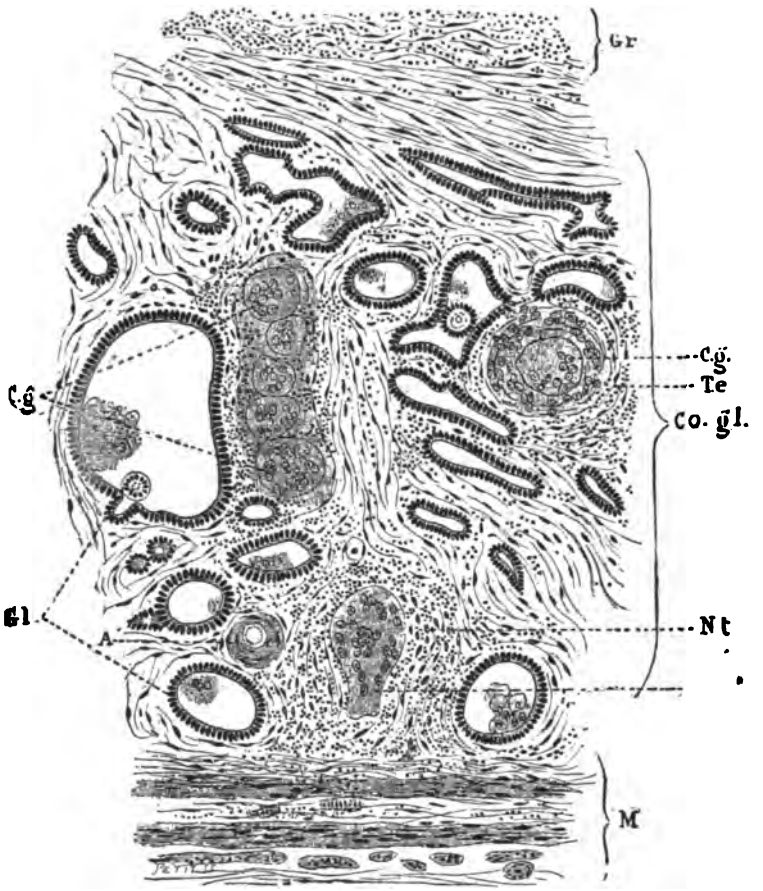

FIG. 58.—TUBERCULOSIS OF THE FALLOPIAN TUBES. Section of wall in pyo-salpinx. (Mag. 150 diam.) *Co. gl.*, glandular layer: remains of the mucous coat, in which are seen dilated glands; *Cg.*, giant cell in the centre of a tubercle formed by a collection of epithelioid cells; *Nt*, tubercular nodules with giant cells; *A*, transverse section of an arteriole; *Gl*, section of glandular tubes; *Gr*, internal layer of granulations; *M*, external muscular layer (Munstèr and P. Orthmann [45]).

thick, puriform, grumous, and caseous, and whose characteristics are the same as those of tuberculosis of the body of the uterus (Fig. 58). Transverse sections obtained after hardening in alcohol show a thickening of the wall and hypertropied and branching vegetations. On the internal surface and in the substance of these vegetations and

villi, we often find numerous giant cells, with several ovoid nuclei, which may take on the form of bent, sinuous, or branched rods, and sometimes groups of crystals (Fig. 59). The free surface of the villi and the folds is almost entirely covered by columnar ciliated epithelium. Here and there these cells have undergone mucoid or granular transformation or they may be desquamated and free in the mucus, associated with a few pus-corpuscles. Staining with rubine to find the bacilli is not always successful. Besides the giant cells and small tuberculous follicles developed in the vegetations, we may find in the muscular walls of the tube some follicles, of a greater or less size, containing giant cells. When the lesion is of long standing, sections of the purulent sac formed by the tube will show a smooth and continuous layer of embryonal tissue on the internal surface. Below it is fibrous tissue dotted with perfectly distinct tuberculous follicles,

FIG. 59.—GIANT CELLS IN GENITAL TUBERCULOSIS. (Mag. 350.) Giant cells with many nuclei, from miliary tubercles of the mucous membrane of the tube; we can see groups of crystals of various forms (Munster and P. Orthmann).

many of which contain giant cells with several nuclei. The walls of the tube are infiltrated with small cells, and have also a few tuberculous follicles. In the layer of fibrous tissue intermediate between the wall and the embryonal layer, we see lines of epithelial cells which come from the epithelium of the mucous lining of the tube; they are in the form of tubular glands. At their periphery we see an irregular paling of columnar epithelium. At the centre are small, pale, rounded or ovoid cells, stained yellow by picro-carmine and whose nuclei are no longer visible. It is a mass of cells which have become necrotic, undergone mucoid degeneration, and become agglutinated gether (Cornil). This lesion, we know, has been called coagulation necrosis.

Koch's bacilli have often been looked for in vain in cases of salpingitis which were certainly tuberculous; but they have sometimes been found, although in small quantity, by Orthmann,[46] Werth, etc. The symptoms are the same as those of non-tubercular salpingitis,

and a probable diagnosis is usually reached by the exclusion of other causes, a study of the family history, and of any signs of the disease manifested in the lungs. The nodular character of the tubal tumor and the frequency of acute attacks of pelvic peritonitis have been considered distinctive of the disease, but they are really valueless, as they are met with in all cases of pyo-salpinx. The treatment must be varied according to whether the lungs are or are not involved.

If the lungs are sound, the attempt should be made to remove the tubes and ovaries by laparatomy. If the patient is phthisical, we shall have to limit ourselves to palliative measures, among which may be mentioned opening of the focus of disease through the vagina or the abdomen, followed by careful disinfection with a tamponade of iodoform gauze.

If pulmonary lesions exist, but are not especially severe, the surgeon must be guided in his procedures by the same considerations which would guide him in the treatment of local tuberculosis in any other situation.

Hegar advises interference in primary tuberculosis as soon as a diagnosis is reached, especially when it is probable that the process will not remain sharply limited. In secondary tuberculosis surgical interference will be indicated only if the pulmonary lesion remain stationary, while the genital lesion tends to increase. Tubercular peritonitis is not a contra-indication: on the contrary, laparatomy has been known to have a good effect upon it.[47] In 1886, Hegar had one death out of six operations. The remote effects seem to have been satisfactory. One patient, who had been operated upon three years previously, was in good condition, although she had had a relapse; another suffered from a severe attack of pleurisy four months after the operation, but was completely restored to health, and remained in good condition for a year. In the case of the other patients, sufficient time had not elapsed to allow of a definite report of the results. Terrillon has also had several encouraging results.

[TUBERCULAR PERITONITIS.[48]— Anatomically the classifications which have been made of tubercular peritonitis are not altogether satisfactory. It is customary, and correct, to exclude the cases of scattered miliary tubercles in the diffuse infective disease, and also those cases in which the peritoneal surface of tubercular ulcers is alone involved. Practically, the great differences which we see post mortem in this condition result from the situation of, the rate of growth of, and the degree of inflammation accompanying the tubercles, and whether

there is much or little exudation—serous, purulent, or hemorrhagic. The anatomical basis in all cases is essentially the same, and the variations which we meet, though distinct and marked, are scarcely sufficient to warrant the elaborate subdivisions of this disease made by certain writers. In reviewing a number of post-mortems in this disease we find that they fall naturally into the following categories: 1. *Acute miliary tuberculosis*, characterized by a sudden onset, a rapid development, and a serous or sero-sanguineous exudation. 2. *Chronic caseous and ulcerating tuberculosis*, characterized by larger tuberculous growths, which tend to caseate and ulcerate, leading often to perforations between the intestinal coils, and a purulent or sero-purulent exudate, often sacculated. 3. *Chronic fibro-tuberculosis*, in which the process may from the outset be subacute, or may represent the final result of the miliary form. There is little or no exudation and the tubercles are hard and pigmented. There exists the closest analogy between tubercle as we see it on the peritoneum and as it occurs in the lung—the fresh miliary eruption, the caseous, ulcerating masses, and the chronic, fibroid, pigmented nodules may be studied with equal facility in either structure. A few practical points in the morbid anatomy may be mentioned. In many cases the process is entirely local. Thus in five of seventeen cases the condition was confined to the peritoneum. In from 30 to 40 per cent of the cases in woman the Fallopian tubes are found affected. The process is commonly confined to the distal ends, and may be primary —which is usual—or is secondary to the peritoneal involvement. A point, worthy of attention on account of its importance as an aid in diagnosis, is the frequent involvement of the pleura. It is often only a dry pleurisy, occurring most frequently without pulmonary affection, and due to direct extension through the diaphragm. The pericardium is also liable in these cases to be the seat of an adhesive tubercular inflammation. Tubercular peritonitis occurs at all periods of life. It is common in children, in whom it is often associated with intestinal and mesenteric disease. It is most common between the ages of twenty and forty. In old age it is rare, but it may occur even in advanced life. The disease is certainly more prevalent among females. It is stated that the disease is more common in the negro than in the white race.

Clinically it is extremely difficult to make a satisfactory classification of the cases of tubercular peritonitis, and we will here only refer to certain special features in the mode of onset and to peculiar

symptoms not, as a rule, very fully discussed. The process may be completely *latent*, and the eruption take place so slowly and so painlessly that the patient may not have presented a single symptom of abdominal disease. The condition has thus been met with in the operation for hernia, and more frequently still in association with ovarian tumor. The onset of the symptoms may be *sudden*, so that the diagnosis of enteritis or hernia may be made. This suddenness of onset is very deceptive and usually leads to the diagnosis of a simple acute peritonitis. The disease may set in with pronounced *gastric symptoms* and stimulate ulcer or cancer. A more common mistake is confounding tubercular peritonitis with *typhoid fever*, which it may simulate very closely. *Ascites* is a frequent symptom, but it does not, as a rule, become very marked; thus Biat,[49] in an analysis of eighty-one observations, found only thirteen instances with extensive ascites. In the acute miliary tuberculosis with rapid exudation the effusion may be bloody, but this is not so common as in cancer, though the opposite statement is usually made. It has frequently been mistaken for the effusion in connection with cirrhosis, of which, indeed, it may sometimes be a complication. It is somewhat remarkable with what frequency acute tuberculosis of the serous membranes occurs in this disease. Moroux[50] and Wagner[51] have called attention to the involvement of the peritoneum, which is not so often affected as the pleura. Acute tubercular pleurisy may occur as a final complication in cirrhosis. Cases with extreme *tympanites* are also common. This condition, the result of impairment of the tone of the muscular coats, is a very constant feature in all forms of the disease. Many writers refer to the fact that the temperature in tubercular peritonitis may be normal, but it is not generally known that the temperature may be subnormal for weeks or months at a time. In the cases of fibrous tubercle without much inflammatory process or effusion, there is, as a rule, very slight fever and subnormal temperatures are common. Increase in skin pigment, particularly on the face, is an occasional symptom in tuberculosis of the peritoneum.

To the occurrence of tumor-like formations in tubercular peritonitis we are indebted for much of the increase in our knowledge on this subject, as the errors in diagnosis have shown the frequency with which these tumors occur and also how amenable the condition is to surgical treatment. The question has not been fully considered by any recent writer, yet its importance may be gathered from the fact that in 96 cases in which laparatomy was performed, in 37 the diag-

nosis was tumor, ovarian or otherwise. We may recognize anatomically, and possibly clinically, four groups of cases in which with tubercular peritonitis tumors occur and may be felt on examination: First, omental tumor; second, sacculated exudation; third, retracted and thickened intestinal coils; fourth, mesenteric glands.

(*a*) *Omental Tumors.*—On the thin and delicate layers of the epiploön tubercles will be found if present at all on the peritoneum, but they do not often form large masses which can be felt through the abdominal wall. The omental tumor in connection with this form of peritonitis results from a slow tubercular process which gradually puckers and rolls the membrane, until it forms an elongated, firm mass attached to the transverse colon lying athwart the upper part of the abdomen. This condition, perfectly well recognized by clinicians, is in many cases peculiar and distinctive. These cases often occur without much exudation, and result from a slow, latent process which may run its course without exciting serious symptoms. To diagnose this condition from cancer is often difficult. A pronounced tubercular history, subnormal temperatures—which are not so common in cancer, and which are specially likely to occur in these more chronic cases of tuberculosis—and the existence of disease in the pleuræ or lungs, are suggestive indications. Fagge[52] calls attention to the existence of a resonant percussion note above the mass, which sometimes feels as if attached to, and indeed has been mistaken for, the edge of the liver, roughened and nodular.

(*b*) *Sacculated Exudations.*—These are the most common, as they are undoubtedly the most puzzling, of the abdominal tumors produced by tuberculous disease; so puzzling, indeed, that, as a long list of cases shows in which the operation for ovariotomy has been performed, the very elect among gynæcologists may be deceived. In these cases a sero-fibrinous or purulent exudation is confined and limited by adhesions formed between the intestinal coils, the parietal peritoneum, the mesentery, and the abdominl or the pelvic organs. What is felt as tumor may be entirely fluid, or it may have an irregular nodular character from the presence between the coils of large caseous masses. These sacculated tumors, due to tuberculosis, may, as in other forms of peritonitis, be met with in the upper, middle, or lower abdominal regions. In the upper zone, which includes the stomach, liver, and spleen, encysted collections of fluid are extremely common. Thus we have the localized peritonitis associated with gall-bladder disease, and with various affections of the stomach and of

the liver and spleen. The effusion in these cases may be limited entirely to the upper region of the peritoneum. In tubercular disease by far the most common sacculated exudation occurs here with perihepatitis over the surface of an enlarged liver, and may lead to the suspicion of a gall-bladder tumor projecting below the edge of the ribs. These encysted peritoneal tumors are less common in the upper abdominal region. In the middle zone, which includes the peritoneal cavity from the level of the transverse meso-colon to the false pelvis, and which embraces the omentum and intestine, these encysted tumors are much more common, and, as the record of operations shows, are very frequently mistaken for ovarian tumor. They fall into two divisions, those in which the entire anterior portion of the peritoneal cavity is occupied by a large collection of fluid, and those in which a more limited sacculated exudation is found on one or the other side of the abdomen or in the middle line. Lastly, there are the sacculated exudations within the pelvis proper, in which case the disease almost always starts from the Fallopian tubes. The tubercular process may be exclusively upon the parietal peritoneum, and the coils of intestines glued to the lateral walls may shut off completely the pelvic from the general cavity.

(*c*) *Retracted and Thickened Intestinal Coils.*—The matting together and thickening of several coils of the intestines may form a mass of great distinctness and even lead to the diagnosis of a solid tumor. This is most frequently met with in the cæcal region. They are not necessarily fixed tumors, but may be freely movable. The coils may not form a uniform tumor, but there may be a separation into three or four irregular masses, divided by fissures and covered with thick lymph. It is possible for the coil to form a resonant tumor.

(*d*) *Mesenteric Glands.*—Less common, perhaps, in tubercular peritonitis than any one of the previous conditions is the presence of tumors caused by enlarged glands. So far as can be ascertained, in none of the cases of laparatomy did they lead to an error in diagnosis. Cases are, however, on record in which extensive tuberculosis of these glands formed palpable tumors associated with ascites. A question of special interest relates to the association of mesenteric gland disease with tubercular peritonitis. Gairdner has urged that in a large proportion of the cases of so-called tabes mesenterica, in which there is enlargement and hardness of the abdomen—the condition which the French speak of as *carreau*—there is involve-

ment of the peritoneum. Jacobi[58] has recently expressed the same opinion.

The *diagnosis* of these peritoneal tubercular tumors offers difficulties which vary greatly in the different varieties. The omental tumor is probably a less frequent source of error than any other, but as an identically similar condition may exist in cancer, it is not always possible, unless there is marked tubercular disease elsewhere, to determine the precise nature; and, as we have seen, even an acknowledged expert like Gairdner may be led astray. The lumpy, nodular character of the mesenteric tumors gives to them also a certain degree of distinctness. The mistake is sometimes made of confounding the large caseous nodules situated between the intestinal coils with the mesenteric glands. The possibility of their recognition depends very much on the degree of distention of the bowels, as extreme tympanites may completely cloak a very large tumor of this character. The tumors formed by contracted and thickened intestinal coils usually lead to error in diagnosis. The recognition of the saccular exudation, more particularly its differentiation from cystic ovarian disease, offers really serious difficulties, the extent of which may best be appreciated by the fact that of 96 cases of laparatomy in tubercular peritonitis, in not less than 30 ovarian disease was supposed to be present. Such being the case, it may be worth while to discuss briefly certain diagnostic details. There is no single criterion which enables us to say in a given case that the condition is one of encysted peritonitis, nor, indeed, is there any special group of symptoms which can be regarded as distinctive. The points most suggestive, in individual cases, of tubercular trouble are:

First: The history of the patient and of the disease. Tubercular antecedents are common. Evidence may exist of old tubercular lesions. Gradual failure in health and strength may perhaps be taken into consideration, but it must not be forgotten that in many of the cases the patients have been robust and well nourished. The mode of onset is in the majority of instances gradual, but this is such a variable factor that it is not of very much value; perhaps the most which can be said on this point is that there can usually be elicited a history of obscure abdominal pains, irregular febrile attacks, and altogether a greater degree of gastro-intestinal disturbance than generally accompanies the slow evolution of ovarian cysts. If the case has been under observation for some time, the fever record should be of great assistance, as high or very low temperatures more com-

monly occur in this condition, though it is true that in inflamed and suppurating ovarian cysts there may be fever of a hectic type.

Second: The local physical signs. If possible, these are more deceptive than the history and symptoms. The question is not so much between the characters of a sacculated exudation and ascites, but it is the extremely nice one of discriminating between two varieties of sacculated effusion, ovarian and peritoneal. In typical cases the physical signs have conformed in every particular to those of cystic ovarian disease. There are a few indications which may at times be useful; thus when the sacculated tumor is limited and small, the outlines may not be so definite and clear as in ovarian disease. This is a point referred to by several writers. The position and form may be variable, owing to alterations in the calibre of the surrounding intestinal coils of which in part the walls are composed. At the periphery of the tumor irregular, nodular bodies—cheesy masses—may sometimes be felt, which in several instances have led to the diagnosis of malignant disease. Depression of the vaginal wall is not a safe indication one way or the other, as the condition may be present in ovarian tumor as well as in encysted peritonitis.

Third: In every case the condition of the tubes and of the lungs and pleura should be most thoroughly examined. The association of a tubal tumor with an ill-defined, anomalous mass in the abdominal cavity should arouse suspicion at once. So also the evidence of involvement of the pleura or of the apex of one lung.

Curability.—Until within the past few years, the general opinion in the profession has been that this disease is incurable; and in looking over the text-books of medicine, with but few exceptions the prognosis is given as "always fatal." Evidence, however, has been rapidly accumulating to show that in a considerable number of cases recovery in this disease is possible, either spontaneously or after operative interference.

(*a*) *Spontaneous Cure.*—There is no inherent improbability why tubercles on the peritoneum should not undergo involution as they do elsewhere. Anatomically the peritoneal growth bears in its evolution a close analogy to the pulmonary, and this is still further borne out by the retrograde changes through which it passes. Just as the aggregations of miliary nodules in the lung may undergo the changes which we speak of as healing, becoming hard and fibroid, so in the peritoneum the tubercle tends in many cases to become sclerotic, and passes into a condition in which it is practically harmless. This

beneficial result is more likely to be seen in cases belonging to the group in which, from the outset, the process is subacute and not associated with much exudation; but there are cases on record in which recovery has followed even after extensive effusion. The anatomical changes are, in brief, these: Fibroid and pigmentary induration of the tubercles, absorption of the exudate, transformation of the fibrinous material into connective tissue, with the union to a greater or lesser extent of the intestinal coils and of the peritoneal surfaces with each other. The cases which are most likely to terminate favorably are those in which the infection is limited to the peritoneum, the inflammation of moderate grade, and the effusion slight in amount and serofibrinous. An adhesive inflammation, as it is termed, may accompany the process from the outset, and a gradual sclerosis may overtake the tubercles and render them harmless. Caseation and ulceration, with a sero-purulent exudation, preclude the possibility of spontaneous cure. Extension to the pleura and lungs, and the coexistence of intestinal or tubal disease, are conditions equally unfavorable to permanent recovery.

(*b*) *Cure by Operation.*—The beneficial effects which, in a number of cases, followed the opening of the peritoneum when a sacculated exudation was mistaken for ovarian tumor, encouraged surgeons to perform laparatomy in ordinary cases of tubercular peritonitis accompanied with much effusion. The questions remain for consideration, What cases are most suitable for operation, and how can we explain the beneficial influence? Undoubtedly cases with fresh eruption and considerable effusion, whether free or sacculated, offer the best chance of recovery, as the disease is more likely to be primary in the peritoneum, the general condition is usually better, and the subsequent chances of general infection are much slighter. When the Fallopian tubes are extensively diseased, and when the process has extended through the diaphragm to the pleura, the condition is of course less favorable. The existence of marked omental tumor, in the form of a transverse ridge, need not necessarily be an objection to operation, as spontaneous resolution of such masses may take place. In cases, then, with somewhat sudden onset, rapid development of ascites with fever of moderate grade, we may be most sanguine of success. In the class of cases with extensive caseous masses in the peritoneum and a purulent exudation, the outlook is necessarily less hopeful; but even in such instances, particularly when the exudation is sacculated, laparatomy may be advised as a palliative measure. In the

chronic adhesive form, no benefit can be expected to follow the operation, which can only be intended to remove an omental mass or to open a sacculated effusion. In the majority of the cases of this group nature is effecting a cure in which she scarcely needs outside assistance; and the danger lies not so much in the peritoneal disease as in the risk of pulmonary infection. It is difficult to explain the beneficial results of the operation. It is interesting to note that not alone in tubercular peritonitis, but in other forms with effusion, the simple opening and drainage of the cavity has seemed to exercise a very beneficial effect on the subsequent course of the disease. Mr. Lawson Tait[54] comments at some length on this remarkable tendency of abdominal neoplasms to undergo retrograde changes after an exploratory incision. His statements on this point are most interesting and deserve the careful consideration of physicians as well as surgeons. He says that he has seen tumors disappear after laparatomy in cases of disease of the liver, spleen, and head of the pancreas. He does not specifically mention cancer of the peritoneum. His remarks deserve quoting, as they bear directly upon this subject: "The cases are far too numerous, and the results indicate sequence far too clearly, for us to dismiss the phenomena as a mere coincidence; nor can we accept the explanation of subsequent medical treatment as having brought about this much-desired ending. I am satisfied that the mere opening of the peritoneal cavity has a direct influence in setting up the process of absorption of the tumor, and my conviction in this direction has increased my confidence in the principle of exploration. That some emphatic physiological change is at once set up by opening the peritoneal cavity is clearly indicated by the uniform onset of a most distressing thirst, which lasts for days, and is not seen so markedly after any other operation known to me. Let the incision in the abdominal wall be made down to the peritoneum, but let the serous cavity remain unopened, and this thirst is not marked. But let the peritoneum be opened but a finger's breadth and the result is marked. That a thereapeutic change is effected in the peritoneum itself by the mere opening of the cavity is now universally recognized in the treatment of what we call tubercular peritonitis by abdominal section. I have now had a large experience on this point, and can say positively that we can cure permanently and speedily cases that have gone even as far as suppuration, by opening and cleansing. But in the bad cases in all probability the cleansing is never complete, no matter how much time and care are spent on it. And in the non-

purulent cases I very often do no cleansing at all, but merely empty out the serum and put in a drainage pipe. Yet the great majority of these cases are cured by these simple means." Evidently, in whatever way brought about, the opening and drainage of the peritoneum favors in a remarkable way the regression of the tubercles; and it does more than this, for with an improvement in the local symptoms the fever reduces and the general condition of the patient rapidly improves. It must not be forgotten that in certain cases the bacilli are very difficult to find in peritoneal tuberculosis, though they may be most abundant even when the tubercles are very hard and fibroid. The important practical point is the relief and cure of these cases by laparatomy, and the surgeons may well leave to the pathologist the minor question of determining the nature of the chronic peritonitis. Among the conclusions which follow from the foregoing considerations are:

1st. That tubercular peritonitis is often a latent affection, localized in the peritoneum, which may even run its course without inducing special symptoms.

2d. That, as in other local tubercular processes, there is in this a natural tendency to healing, which takes place more frequently than has hitherto been supposed.

3d. That statistical evidence shows laparatomy to be in many cases a palliative and in a certain number a curative, measure.]

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13. Predöhl (Obstet. Soc. of Hamburg, January 31st, 1888. Centr. f. Gynäk., 1888, No. 20) presented a convincing observation of a woman of 61 years, who for a year and a half had suffered from diarrhœa, and pain upon the left side of the abdomen, and who suddenly died of meningitis. At the autopsy a double caseous salpingitis, and great thickness of the uterine mucous membrane was found. Although the search for bacilli gave a negative result, there is no room for doubt that it was a case of long-standing tuberculosis; there were no tubercles in the peritoneal cavity, but upon the meninges and the liver. The pre-existence of the tubal lesion seemed evident. Dudefoy (Bull. Soc. Anat., March 15th, 1889) showed advanced lesions of the tubes in a patient who had died of rapid tubercular meningitis: it seemed probable that he was right in considering that the lesion of the tubes was tubercular and preceded the other.

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CHAPTER XI.

INTRA- AND EXTRA-PERITONEAL PELVIC HÆMATOCELE.

Definition, Classification.—A mere effusion of blood, intra-pelvic hemorrhage should not be confounded with hæmatocele. The term, which has both an anatomical and a clinical significance, should be reserved for encysted collections of blood. As I shall show later, such a condition occurs only under special pathogenic circumstances which impart a durable character to the lesion, and give it a distinct morbid entity.[1] The effused blood may have one of two situations: 1st. It may be within the peritoneum and in that case usually accumulates behind the uterus; this is intra-peritoneal hæmatocele; its clinical history was the first to be distinctly outlined. 2d. The blood may spread below the serous membrane, within the broad ligaments, and into the peri-vaginal cellular tissue; it here forms a veritable thrombus, and the earlier writers[2] described it by that name. The name of extra-peritoneal hæmatocele[3] is less appropriate than that of hæmatoma,[4] but it has been fixed by custom.

INTRA-PERITONEAL PELVIC HÆMATOCELE.—*Synonyms:* Retro-uterine (Nélaton), peri-uterine (Gallard), pelvic (MacClintock), peri-hysteric (Trousseau), uterine (Bernutz), circum-uterine (De Sinéty) hæmatocele; these are some of the various names which have been given to the affection. I have adopted the name of pelvic hæmatocele, which is the most comprehensive; but it must be acknowledged that the name chosen by Nélaton[5] (retro-uterine hæmatocele) applies best to the clinical variety most frequently met with.

Historical Outline.—To Nélaton is justly ascribed the honor of having been the first to inscribe this disease in the nosological tables by his masterly description of it. It will not in the least detract from his merits to mention the ideas held by Ruysch upon the effusion of blood within the peritoneum; by Bourdon[6] upon the physical signs of these tumors, ideas which were vaguely hinted at by his teacher Récamier;[7] by Velpeau,[8] who seems to have diagnosed them without pronouncing upon their exact situation. Special mention should be made of the works of Bernutz,[9] in which he ably delineated

many of the features used later by Nélaton in his more extended work. In addition, we must cite the important works of Huguier, Puech, A. Voisin, Trousseau, Langier, Gallard, Besnier, Poucet, MacClintock, Barnes, Schröder, Olshausen, Bandl, etc., to the greater number of which I shall have occasion to refer again.[10] We see by this list that, although good work has been done by foreign scientists, the chief researches in regard to this affection have been carried on by Frenchmen.

Etiology. Pathogenesis.—The effusion of blood into the pelvic cavity is probably quite frequent: there is no doubt that at the menstrual period the tubes are the seat of an exudation of blood as well as the uterus. Many menstrual disorders caused by fatigue, strain, or cold are really due to the effusion of a small amount of blood into the peritoneal cavity, where it is rapidly absorbed. We know by numberless physiological experiments, as well as by observation of what occurs during many laparatomies, how easily the blood disappears when the peritoneum is in a healthy condition. But let it be impaired or destroyed, and this absorptive power disappears at once; hence the necessity for drainage in many cases of laparatomy. Here also is the probable explanation of hæmatocele. In fact, if an extensive effusion of blood fails to be absorbed, as occurs or instance after the rupture of an extra-uterine tubal pregnancy, the clots which are formed act as foreign bodies; the peritoneum is impaired, and by the formation of its protective false membranes tends to isolate the cause of irritation.[11] The imprisoned blood undergoes a slow process of molecular disintegration, and sometimes, under the influence of septic infection derived no doubt from the tube, may even decompose and become mixed with pus.

If the blood from an intra-peritoneal tubal hemorrhage spread slowly, and be of small amount, it will be absorbed unless some previously existing condition oppose, and this condition is usually an inflammation of the pelvic peritoneum surrounding the diseased tubes which are the source of the hemorrhage. A great number of autopsies and examinations during laparatomy have demonstrated this origin. F. Imlach[12] reports that in fifteen cases of laparatomy for hæmatocele he found both tubes distended by thick black blood, exactly like that effused into the abdomen. Now, tubal pregnancy is not to be thought of when the lesion is bilateral, nor can we admit a reflux of blood from the abdomen into the tubes. E. Sinclair Stevenson[13] also believes, from evidence furnished by specimens of extirpated tubes,

that the narrowed calibre of the inflamed tubes may cause hemorrhage into the peritoneal cavity at the menstrual period. Tubal inflammation prepares in advance for encysting the effused blood, by the formation of false membranes around the fimbriated extremity of the tube; the vestiges of these membranes are found in the partitions of the cyst. Slight attacks of pelvic peritonitis, with relapses, are almost always observed at the outset of the disease.

The usual origin of extensive effusions of blood is undoubtedly the early rupture of an extra-uterine tubal pregnancy. For a more detailed description of this accident, consult the chapter devoted to the subject. Here I will simply remark that this rupture is often accomplished by several successive efforts, rather than at one time. As to the progressively developed and concealed hæmatocele, it is usually an intra-peritoneal tubal hemorrhage and presupposes the existence of salpingitis.

This question of pathogenesis has been and still is the subject of dispute. I will briefly review the various theories which have been successively advanced. Each one seems to exclude the others, and yet it is probable that they all are founded upon well-authenticated cases; one factor only is constant, and that is the impairment of the absorptive power of the pelvic peritoneum, which is either a primary or secondary affection, and caused by pre-existing perisalpingitis or by the abundance of the effusion which injures the peritoneum by prolonged contact and a sort of permanent imbibition.

Varicose Rupture.— The rupture of varicosities of the utero-ovarian venous plexus, pointed out by Ollivier (of Angers) in 1834, was given especial prominence by Professor Richet. Winckel has shown that the phleboliths contained in the varicose veins may ulcerate through their walls toward the peritoneal cavity as well as toward the interior of the broad ligament.[14]

Disorders of Ovulation.—This theory attributes the production of hæmatocele to some ill-defined irregularity of ovulation; if the tube is not in exact contact with the ovary at the moment of ovulation, the blood will be effused into the peritoneal cavity.[15] Gallard[16] believes that in every case of hæmatocele there is extra-uterine ovulation, whether the ovule have been impregnated or not.

Reflux through the Tubes.— The majority of the older writers deny that the tubes themselves have any part in the catamenial flow; but they admit the possibility of a reflux of the menstrual blood from the uterus, under some disturbing influence. Trousseau[17] attaches

much importance to displacements of the uterus. Bernutz, who admits that hæmatocele may be symptomatic of the menstrual flow, supports his view upon the authority of Ruysch and Haller. Alph. Guérin[18] suggests that the troubles produced by membranous dysmenorrhœa are of a nature to cause an effusion of blood into the peritoneal cavity. He says: "The uterine mucous membrane swells to such an extent during menstruation that it entirely fills the uterine cavity. When the menstrual crisis is to terminate in the exfoliation and throwing off of this membrane, its turgescence does not prevent hemorrhage, but merely impedes its flow into the vagina; the mucous membrane becomes detached from the subjacent tissues and for a while hermetically seals the opening into the cervix, while the tubal orifices are open." The uterine contractions then would tend to expel the blood through the ostium abdominale into the peritoneal cavity. Guérin quotes in support of this theory a case of membranous dysmenorrhœa complicated by hæmatocele, and claims to have seen many other examples. These facts are perfectly natural, and easily understood if we remember that membranous dysmenorrhœa is usually due to acute endometritis, which may coexist with a hemorrhagic salpingitis.

Ovarian Apoplexy.—Microcystic degeneration resulting from chronic ovaritis, follicular cysts, and cysts of the corpus luteum are sometimes the seat of hemorrhages, and their rupture may cause an effusion of blood into the peritoneal cavity.[19]

Pachy-Peritonitis.—We know that meningeal hemorrhages are due to the rupture of the dilated and friable vessels of the false membranes in anterior pachy-meninigitis. Dolbeau[20] was the first to demonstrate this interesting fact of general pathology, and then Virchow,[21] who is usually considered to be the originator. Might not a similar process explain the formation of hæmatocele? The idea is natural in view of the formation of false membranes due to pelvic peritonitis. Ferber,[22] Besnier[23] and Bernutz[24] developed this theory, which has certainly been over-abused.

Rupture of Extra-uterine Pregnancy.—Huguier gives to occurrences of this nature the name of pseudo-hæmatocele. If the rupture is accompanied by extensive hemorrhage and causes sudden death, it could not legitimately be given the name of hæmatocele. But why refuse it to the cases where the effusion is circumscribed and encysted? It is even probable that these cases are more frequent than is usually supposed,[25] and that there are intra-peritoneal abortions, so to speak,

which are often overlooked like the ordinary abortions when they occur in the first weeks of conception.

Among predisposing causes must be mentioned any general disease which causes hemorrhages. But it would be absurd to give the name of hæmatocele to the effusions of blood into the pelvis in cases of scorbutus, icterus, phosphorus poisoning, etc.

I should not omit to point out the influence of menstruation as a determining cause. Hæmatocele usually makes its appearance at the menstrual period, as we can readily understand if we consider the congested state of the pelvic organs at that time. Anything adding to the existing erethism, as fatigue, shock, coitus, etc., acts in the same way.

Without denying to each of the causes given some part in the etiology of intra-peritoneal pelvic hæmatocele, we may assert that the great majority of cases start from some tubal lesion; hemorrhagic salpingitis with peri-salpingitis in the case of progressive hæmatocele of moderate amount; fœtal cyst for the sudden and abundant hæmatocele called cataclysmic (Barnes).

Pathological Anatomy.—The tumor is usually situated in the cul-de-sac of Douglas, which is the most dependent portion of the pelvis; hence the name retro-uterine hæmatocele, chosen by Nélaton. Previously existent plastic inflammation may obliterate the cul-de-sac, and the blood will then accumulate between the bladder and the uterus under the influence of gravity, and an ante-uterine hæmatocele will thus be formed. G. Braun[26] and Schröder[27] give some examples of this kind; other more numerous examples refer to ante-uterine extra-peritoneal hæmatocele.

At the outset, the blood is liquid, and forms a sort of lake which is easily displaced, for it is rare to have pre-existing false membranes constituting a sac. The cyst, however, is rapidly formed, and is then entirely separate from the mass of intestines. It may therefore be difficult to distinguish the arch formed by the new membranes from an uplifted peritoneum, and to differentiate between an intra- and extra-peritoneal hæmatocele. In the latter form, however, the tumor is more laterally situated, as it is chiefly the broad ligament which has been unfolded and displaced. The sac adheres anteriorly to the posterior wall of the uterus, which is pushed toward the symphysis; it is of a blackish color. The ovaries and tubes become less and less recognizable and more easily confounded with the walls of the tumor. Sometimes the tubes are filled with blood, and torn;[28] in the case of

fœtal cyst, only one is affected. The agglutinated intestines may adhere to the cyst wall. When it is opened, we find a mass of coagulated or syrupy, semi-liquid blood, according to the length of time that the lesion has existed. It is black in color, like the interior of a raisin; in the most external part we may find layers of whitish fibrin. The cyst walls are thick in some places, and thin in others where a rupture seems imminent. The rectum is compressed and displaced (Fig. 60).

We must not confound with hæmatocele the hemorrhages occurring within ovarian cysts; their walls possess a characteristic struc-

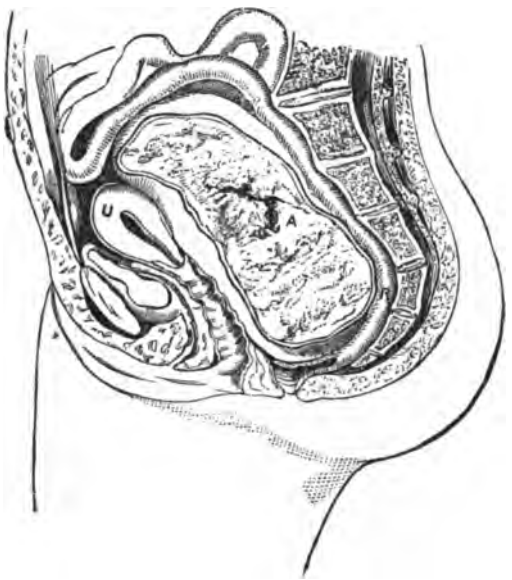

FIG. 60.—RETRO-UTERINE HÆMATOCELE. *U*, Uterus; *R*, rectum; *A*, intra-peritoneal hæmatocele encysted by false membrane.

ture. It is also incorrect to give the name to the temporary accumulation of clots in a pelvic abscess which has been punctured.[29] The size of the tumor varies; it may reach that of the uterus at term. If it persist a long while, compression of the ureters may lead to renal lesions as in the case of other abdominal tumors. Suppuration frequently occurs. At autopsies signs have often been found of attempted spontaneous cure—absorption of the fluid and retraction of the sac, which was filled with newly formed connective tissue, stained by the pigment of the blood.[30]

Even in cases where there is reason to suspect the rupture of a tubal pregnancy as the cause of the lesion, we do not usually find any

trace of a fœtus; it usually disintegrates and is absorbed. This rupture occurs very suddenly toward the second or third month; it is only when the autopsy is held soon after the beginning of the accident, and when the fœtus was alive only a short time previous to its occurrence, that it may be identified among the clots. Often the patient dies so suddenly that no cyst is formed and there is merely an internal hemorrhage. Still, there may have been a previously formed hæmatocele, a second one proving fatal; in that case the phenomena develop with sufficient rapidity to allow of identification of fœtal remains at the autopsy.[31] Though the fœtus leave no trace, it is not so with the chorionic villi which may be found by a careful examination and which frequently reveal the cause of the lesion. L. Tait has thus proved that pelvic hæmatocele is the ordinary termination of extra-uterine pregnancy.[32]

Symptoms.—The appearance of hæmatocele is usually preceded by morbid symptoms connected with the uterine appendages: pain, disorders of menstruation, gastric reflexes. They indicate salpingitis or extra-uterine pregnancy. It is seldom that the effusion of blood is not ushered in by acute accidents, but their intensity varies. They may be what Barnes calls cataclysmic: melancholia, syncope, cold, sudden death. If the patient survive this internal hemorrhage, the symptoms of an abdominal tumor appear, while the general symptoms gradually disappear.

In less severe cases, the onset is marked only by local pain and a sensation of weakness, joined to an increase in size of the abdomen.

Finally the intra-peritoneal oozing of blood may occur in an insidious, almost imperceptible manner.

Upon the days following the first appearance of the morbid phenomena, attacks of plastic peritonitis circumscribe the effused mass, and occasion nausea, abdominal distention, pain, and fever.

The objective signs revealed by touch and bimanual palpation are those of a fluctuating tumor in the cul-de-sac of Douglas, which pushes the uterus upward so that the cervix is reached with difficulty. If we do manage to reach it, we find it flattened against the pubis. The tumor soon loses its fluctuation, and acquires a consistency like that of snow; but this consistency may vary greatly, and in some places be hard and in others soft. Bimanual exploration will enable us to outline the body of the uterus, which seems to be encased in the tumor that fills and more than fills the pelvis (Fig. 61). Rectal touch is greatly interfered with by the compression of the intes-

tine. This compression may give rise to symptoms of internal strangulation; that of the bladder to retention of urine; that of the sacral plexus to acute neuralgias of the lower limbs. The general condition varies; even when there is no suppuration, we frequently observe irregular attacks of fever, due to the peritoneal reaction caused by the formation of false membranes.

The course of the disease is essentially chronic, but successive acute attacks occur, as if additional amounts of blood were from time to time effused. They may be manifested a few days after the onset or later at the menstrual periods, no doubt under the influence of the

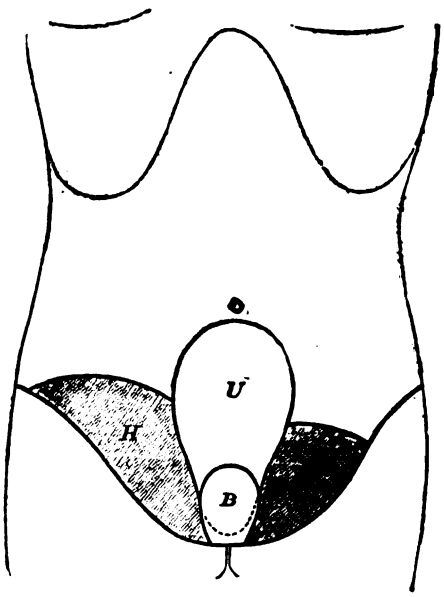

FIG. 61.—RETRO-UTERINE HÆMATOCELE. *U*, Uterus; *B*, bladder; *H*, hæmatocele.

catamenial congestion. When the intra-peritoneal hemorrhage is caused by the rupture of a fœtal cyst, a relapse is especially to be feared, and may cause sudden death, even when it seems as though all danger had passed. Outside of these exceptionally severe cases, the disease tends to a cure by progressive absorption or spontaneous evacuation; the latter, however, which can only occur after suppuration of the sac, may cause grave accidents.

In the most favorable cases the patient is unable to walk for many months, and is exposed to repeated slight attacks of peritonitis during which the tumor is subjected to changes of size and finally diminishes by degrees. After its disappearance, there may remain an

indurated nodule, or simply a displacement and immobility of the uterus.

Suppurative inflammation is ushered in by an aggravation of the general symptoms, erratic chills and sweats. At the same time the tumor increases in size and softness. Perforation into the abdominal cavity is rare. The peritonitis which sometimes occurs in cases of suppuration of the sac is usually due to direct propagation of the inflammation through the walls.

Perforation into the rectum is more frequent. It is preceded by signs of rectitis, and ushered in by sudden diarrhœa with black and fetid stools, causing a sensation of relief and a disappearance of the tumor. The evacuation may be complete and recovery follow; but, on the other hand, death may occur from exhaustion or from infection caused by the entrance of fecal matter. Perforation into the vagina is rare; into the bladder [83] it is altogether exceptional.

Diagnosis.—The clinical picture given by hæmatocele is often so characteristic that there is no possibility of mistake. The sudden appearance of a retro-uterine tumor, coinciding with the phenomena of internal hemorrhage, is pathognomonic. The rupture of a pyosalpinx or of a pelvic abscess causes only sharp pain and symptoms of peritoneal reaction, usually more intense than in hæmatocele, and there is no tumor. Neither will there be danger of mistaking it for a retroflexed gravid uterus. One of the best means of avoiding error is to endeavor to outline the boundaries of the uterus, which in hæmatocele is enclosed in the centre of the swollen mass. This examination will be facilitated by anæthesia. Ovarian cysts [84] and uterine fibroids imprisoned within the pelvis have nothing in common with hæmatocele except the objective symptoms; their manner of appearance and their course are entirely different. The same may be said of extra-uterine pregnancy, which, moreover, is rarely situated directly behind the uterus. The hypertrophy of the organ and persistent amenorrhœa favor the supposition of ectopic pregnancy; as I have said, this is often only the starting-point of later hemorrhages.

At an advanced stage, inflammatory nodules of perimetro-salpingitis can only be diagnosed by the history of the case.

The diagnosis of the origin of the hemorrhage cannot be definitely made. In the hæmatocele that is ushered in suddenly, "dramatically" (according to Bernutz), we are usually safe in considering the cause to be rupture of a fœtal cyst. The hæmatocele which begins insidiously and progresses slowly is usually due to a gradual effusion

of blood caused by hemorrhagic salpingitis. Where large varicosities exist, there might be a rupture of a vein of the broad ligament.

Prognosis.—The affection is serious; in rare cases, sudden death occurs; there is always the danger of severe accidents before recovery is established. Moreover, a cure is rarely complete; the plastic remains around the uterus are a frequent source of discomfort, and almost invariably cause sterility.

Treatment.—Active interference is justified only by the appearance of accidents which may endanger the life of the patient. In the beginning, if the symptoms are not severe, we may apply ice to the abdomen to combat both the hemorrhage and the peritonitis. Absolute rest is indicated; the bladder is to be regularly emptied by the use of the catheter and the intestines by enemata. We must be careful not to administer too much opium for the pain, on account of its constipating effect. Antisepsis of the vagina is to be carefully looked out for, in order to avoid all danger of infection through the genital tract.

The history of surgical interference in this affection can be divided into three periods: from Récamier's time to Nélaton's it was thought necessary to always puncture or incise these collections of effused blood whose spontaneous absorption seemed impossible; later the number of unsuccessful results caused this method to be abandoned, and it was discovered that large hæmatoceles were apt to become spontaneously cured; the expectant treatment was then systematically adopted. At the present day we leave the disease to itself so long as it follows a regular and progressive course toward absorption. But, thanks to antisepsis, we need no longer hesitate to interfere as soon as the patient's life seems to be threatened by compression or inflammatory phenomena. Rapid evacuation of the cyst is then obligatory.

Incision is preferable to puncture; the latter does not permit of the evacuation of solid matter nor of a thorough cleansing, and may form a septic fistula. The site of incision is to be determined by the protrusion of the tumor.

If it project frankly into the posterior cul-de-sac, it should be opened through the vagina. The cervix is drawn forward, the index of the left hand placed in the rectum, while by the use of retractors the operating field is enlarged as much as possible, and an incision is made following the axis of the tumor, with care not to go too far to the sides on account of the ureters. The finger in the rectum serves as

a guide in avoiding the intestine. As soon as the interior of the cyst is reached, the incision is enlarged with the scissors, if necessary, and the evacuation of the syrupy fluid and the clots aided by weak antiseptic injections. In one case I was obliged to use a soup ladle to take out a mass of clots. We should proceed with the greatest care, and not attempt to cleanse out the cavity too suddenly, for fear of injuring the adhesions bounding it. After cleaning, we fill the cavity with a loose tamponade of strips of iodoform gauze (prepared in a weak solution), which are to be left in place for forty-eight hours; this protects against further hemorrhage, and completes the process of disinfection.[35] When this gauze is removed, the antiseptic irrigations are renewed, and a T-tube is inserted, which is packed about with gauze, but only in the vagina, from fear of absorption. The free end of the tube is to be wrapped in antiseptic dressings; injections may be made through the tube once or twice a day if necessary. If the cavity be very large, each antiseptic injection should be followed by one of boiled water, otherwise we may have toxic symptoms.

Antisepsis has completely altered the prognosis of this operation. Nélaton, who at first advocated its use, gave it up[36] on account of the frequent cases of septicæmia following it. Gusserow gives his personal experience, consisting of eight cases, with six cures lasting from six to twenty-one days; he advocates interference in very serious cases only. Routier[37] reports three cases successfully treated by vaginal incision, which he now prefers to laparatomy. Vaginal incision necessitates perfect antisepsis, and is often dangerous when the tumor is some distance away from the posterior cul-de-sac, which may be obliterated, and projects into the abdomen. If the cavity is very large, a vaginal incision, which must always be limited in extent, may be insufficient for complete evacuation and perfect antisepsis. Under these conditions, I once successfully performed subperitoneal laparatomy.[38] This operation (see page 73, Treatment of Pelvic Abscess) consists essentially in a long incision parallel to the crural arch, the detaching of the peritoneum as far as the cyst, and penetration into the latter through the surface which adheres to the pelvis, without entering the large serous cavity. After having carefully emptied the blood-cyst, its cavity is to be explored by the introduction of the fingers into its most dependent portion, and by combining vaginal touch with this procedure, we determine the most favorable point for the insertion of a drainage tube through the posterior cul-de-sac. Whether the cyst be small or large, this drainage with a T-tube is to be com-

bined with drainage by abdominal incision with two tubes fastened together like gun-barrels, or a series of tubes in juxtaposition like the representations of Pan's flute, or with strips of iodoform gauze. For two or three days at least it will be well to loosely tampon the cavity with the gauze prepared in a weak solution of iodoform; this has the triple advantage of opposing secondary hemorrhage *a vacuo*, of completing the antiseptic treatment, and of supplementing the passive action of drainage tubes by more active capillary drainage.[39]

If, during an attempted subperitoneal laparatomy, we are unable to detach the peritoneum as far as the point where the pocket adheres to it, we can always resort to the following process: We freely incise the peritoneum at the bottom of the wound, and place tampons upon the pocket which is intact, so as to provoke the formation of a passage closed in by adhesions between it and the incision. After twenty-four hours the tampons are removed and the cyst opened.

Laparatomy properly so called, or transperitoneal incision, has given good results.[40] If possible, we must fix the pocket to the abdominal wall by veritable marsupialization, empty it, tampon, and drain. This theoretical manœuvre is rarely practicable, as there is so seldom a well-defined and resistant pocket; the walls are usually formed merely by the agglutination of neighboring organs. We may be obliged to limit ourselves to an antiseptic irrigation of the cavity, and then simply abandon it in the abdomen. Capillary drainage and a tamponade with iodoform gauze would be advisable in such a case.

It seems to me that transperitoneal laparatomy should rarely be performed, on account of the danger of septic peritonitis.[41]

One case in particular, and fortunately a rare one, necessitates prompt surgical interference; this is when the starting-point of the troubles is the abortion of a tubal pregnancy. In such cases the hemorrhage comes in successive attacks; shall we wait for the catastrophe or anticipate it by an immediate laparatomy? Martin[42] reports a case where he regretted having abstained from operating; the patient died of a fresh hemorrhage four days after the consultation. In such cases bold interference seems to me not only legitimate, but absolutely called for at once by the special clinical symptoms.

EXTRA-PERITONEAL HÆMATOCELE.—The effusion of blood into the connective tissue of the pelvis has been called extra-peritoneal hæmatoma, thrombus of the broad ligaments, and pseudo-hæmatocele. Some writers have denied its existence outside of the puerperal state,

in which thrombus of the vagina and vulva may also be produced, but at the present day its existence is acknowledged.[43]

Etiology.—It may be produced by the influence of pregnancy, which, as we know, causes a dilatation of the entire pelvic venous system, especially of the utero-ovarian plexus. But utero-ovarian varicocele may exist and cause a subserous rupture, even outside of pregnancy, from rupture or ulceration of veins containing phleboliths. It is usually observed as a result of overwork or sexual excesses, during the menstrual period, in multiparæ whose veins are more dilated than those of women who have never had children.

According to Byrne,[44] thrombus of the broad ligament is more frequent than is usually admitted, and may often cause pelvic abscess or phlegmon. Skene Keith [45] calls attention to the fact that an ephemeral extra-peritoneal hematocele often follows salpingotomy, because of a congestive hemorrhagic outbreak at the period corresponding to the next menstrual epoch. Beigel [46] believes that extra-peritoneal hæmatocele constitutes a considerable portion of cases usually classified under the more ordinary form.

Pathological Anatomy.—The blood may form a circumscribed tumor between the folds of the broad ligament, which, not being a closed cavity, but communicating with the pelvic cellular tissue, permit of an escape of the blood if it be abundant; the effusion then is directed toward the vagina and rectum. The tumor is usually of medium size, varying from the size of a fist to that of a man's head. It is frankly lateral, and, should two tumors exist, one is always much larger than the other. The two may, however, unite. Sometimes the tumor is in front of the uterus.[47] A. Martin,[48] who has had the opportunity of studying the pathological anatomy in several operations, has always found a pocket with an irregular surface, studded with diverticula which penetrate the cellular tissue, and crossed by bridles of connective tissue and broken blood-vessels. The contents are formed of blood and more or less degenerated clots; there is sometimes an admixture of pus; it may communicate with an intra-peritoneal effusion by a tear in the broad ligament.

Symptoms.—This accident usually occurs to women who are apparently in a healthy condition. Sharp pain in the abdomen with a tendency to syncope mark the onset. There may, however, be successive attacks. The symptoms of profound anæmia and troubles due to compression of the bladder and rectum are manifested, together with swelling and tenderness of the abdomen. By touch and biman-

nual palpation we feel that the tumor is in the broad ligament and not in the cul-de-sac of Douglas; it is soft and pasty; the uterus is upon its internal surface, and more or less pushed aside, but it can be distinctly outlined on every side. As to the other symptoms and the course of the disease, they are the same as those given for intra-peritoneal hæmatocele.

One special symptom, ecchymotic spots of the vagina, belongs to extra-peritoneal hæmatocele. In some rare cases ecchymosis of the abdominal wall has been observed.[49] The differential diagnosis between it and extra-peritoneal hæmatocele cannot always be made. It must be based upon the etiology, the frankly lateral situation of the tumor, and its relations.

Treatment.—Expectant treatment is the rule. If the gravity of the symptoms calls for interference, we cannot do a vaginal operation because of the danger of wounding a large vessel or the ureters. Subperitoneal laparatomy seems to me to be the best operation. Martin recommends transperitoneal laparatomy, with cleansing of the cavity, and suture of the wound over a T-tube which emerges through the vagina. He has had nine successful results out of ten operations.

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laparatomy in three cases of hæmatocele, of which two were suppurative. The wound was sutured to the abdominal walls, and drained; a cure followed. In two of the cases the bladder was wounded, and a fistula was formed.

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CHAPTER XII.

EXTRA-UTERINE PREGNANCY.

In extra-uterine or ectopic pregnancy (Barnes) the impregnated ovum is developed outside of the normal uterine cavity.

Pathology—Etiology.—Extra-uterine pregnancy is determined by any condition preventing the application of the ampulla of the tube to the surface of the ovary at the time and place of rupture of the Graafian follicle. We know that spermatozoa may penetrate to the peritoneal cavity, and that they may there retain their functional life; also that the ovule may travel a considerable distance without losing its vitality.[1] The most frequent conditions leading to extra-uterine pregnancy are adhesions of the ovaries and tubes, a result of peri-salpingitis; loss of the ciliated epithelium; or an obstacle to the migration of the ovum in the shape of an intra-tubal polypus.[2] Emotional conditions at the time of conception have also been suggested as a cause.

The condition is somewhat rare. Out of sixty thousand women examined in the course of seven years in the clinics of Carl Braun and Späth, of Vienna, there were but five cases of extra-uterine pregnancy.[3] This proportion would seem to be too low: Fasola[4] observed an equal number of cases out of only 1,565 pregnancies in multiparæ who had remained for some time sterile.

[Greater skill in diagnosis and early resort to laparatomy in doubtful cases have proved this condition to be much more frequent than was supposed a few years ago. Tuttle,[181] of New York, has reported nineteen cases operated upon within a short time and has seen five cases during the last four months at the Roosevelt Hospital.]

Classification.—Numberless divisions and subdivisions of this subject have been made, but are of little value. The greater number of fœtal cysts are situated in the tubes and are tubal pregnancies. If the ovum is developed entirely within the tube, we have a simple tubal pregnancy; if the uterine walls are also involved, it is a tubo-uterine or interstitial pregnancy; and if the fœtus is partly within the abdominal cavity, a tubo-abdominal pregnancy; to these varieties

may be added the tubo-ovarian. If the tube should rupture and the development of the fœtus continue within the abdominal cavity, we have a secondary abdominal pregnancy. Some authorities maintain that abdominal pregnancy may be primary. If the rupture occur in the attached portion of the tube, the fœtus may develop within the folds of the broad ligament—a condition to which has been applied the name of subperitoneal.[5] Finally, there exist several well-established cases of ovarian pregnancy in which the ovum has developed upon the surface of the ovary, but their number is smaller than has been supposed. Certain anatomical characteristics make the diagnosis between this variety and abdominal pregnancy difficult.

FIG. 62.—TUBAL PREGNANCY OF TWO AND A HALF MONTHS, SAC CLOSED (BOUILLY).

Pregnancy in a rudimentary horn of the uterus differs so essentially from normal pregnancy, and so resembles fœtal cysts, that its description should be included with that of extra-uterine pregnancies. For this reason the term ectopic is preferable to that of extra-uterine pregnancy.

Pathological Anatomy—Tubal Pregnancy properly so called.—Hennig[6] found the ovum occupying the central portion of the tube in 77 out of 122 cases. In 10 it was situated in the proximal portion, in 17 near the centre, 8 times in the outer third, and 5 in the external fourth. We know of at least 12 well-authenticated cases of tubal pregnancy carried to term.[7]

As soon as the ovum has become fairly attached, the mucous membrane of the tube undergoes a transformation similar to that of the uterine mucous membrane in the formation of the decidua. Roki-

tansky has well described the downy appearance of the mucosa, the villi of which interlace with those of the chorion. Until the placenta is formed, their mutual adhesion is but slight; the proximal orifice of the tube may remain open and the change in the mucosa extend to the lining of the uterine cavity.

During the first three months the small tumor which is seen upon opening the abdomen can in no wise be distinguished from an ordinary hæmato-salpinx, as its cavity is generally filled with effused blood. It is usually egg-shaped, but sometimes resembles a bag-pipe (Fig. 62), and contains a transparent liquid in which the embryo floats, or

FIG. 63.—TUBAL PREGNANCY OF TWO AND A HALF MONTHS, SAC OPENED (BOUILLY).

clots of more or less recent formation, which are sometimes stratified like those found within an aneurismal sac. In the latter case there may be some difficulty in finding the little fœtus, and oftentimes the nature of the fœtal cyst can be proved only by the identification of the chorionic villi on the walls of the tube. The cyst is usually pedunculated, but is sometimes broadly adherent to the surface of the broad ligament, often penetrating into its substance and causing an expansion of its folds. More rarely the cyst walls are so thin and transparent that the embryo can be seen.[8] Hennig has noticed that the muscular layer of the tube hypertrophies until the end of the second month; later, under the influence of progressive distention, it becomes thinned and the fibres separate.

Early rupture is the rule in tubal pregnancy. Out of 45 cases

studied by Hecker,[9] the rupture occurred 26 times during the first two months, 11 times in the third month, 7 times in the fourth, and once in the fifth. Hoffmann [10] in 8 medico-legal autopsies, found the rupture 7 times in the second month, and once in the third. The size of the ruptured cyst is usually that of a hen's egg. Kaltenbach [11] believes that adhesions preventing the expansion of the tube are an immediate cause of rupture. The tearing apart of excessively vascular adhesions may in itself be the cause of severe hemorrhage; Kaltenbach has reported a case in which it was fatal. Freund [12] has had a case, thus far unique, in which the rupture was due to myxomatous degeneration.

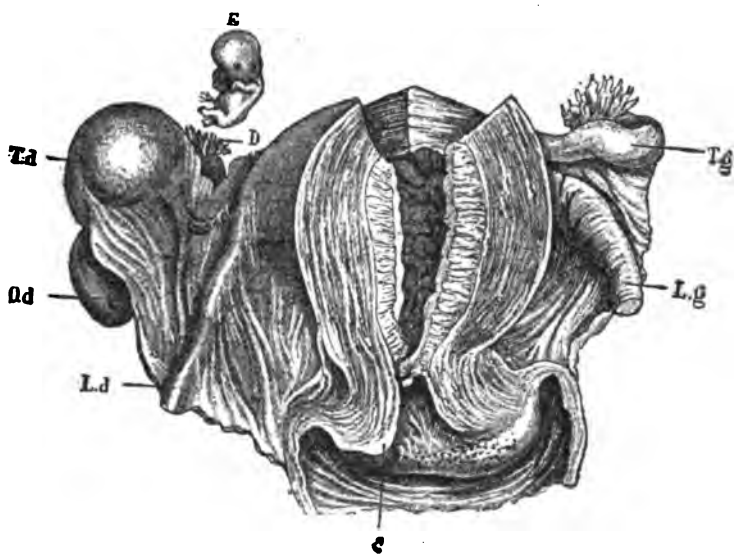

FIG. 64.—TUBAL PREGNANCY IN WHICH RUPTURE HAS OCCURRED. *Td*, Right tube, in which may be seen the tear *D* beneath the embryo *E*; *Od*, *Ld*, right ovary and round ligament; *Tg*, *Lg*, left ovary and round ligament; *C*, cervix. (Fœtus of about two months; the mother died in a few hours from internal hemorrhage. Specimen belonging to Professor Hoffmann, and placed in the Medico-Legal Museum of Vienna.)

Rupture of the tube usually occurs into the peritoneal cavity, causing the variety of hæmatocele which Barnes has named cataclysmic. Should the rupture occur within the folds of the broad ligament, the resulting hæmatocele is extra-peritoneal, and the ligamental folds tend to limit the extent of the hemorrhage.

The course of development of tubal pregnancy varies. In exceptional cases, the embryo perishes at an early date, and is so completely disintegrated that no trace of it can be found. The sac no longer increases in size, but may be transformed into a hæmato-salpinx by the internal hemorrhage which has caused or accompanied

the death of the embryo. The clinical characters and the prognosis of the lesion, of course, vary greatly. The surgeon who later performs an operation for its extraction often finds the greatest difficulty in establishing its true nature, even by a microscopical examination of the walls in which there are usually a few chorionic villi to be found. Even complete absorption of the contents of the tube may occur after a longer or shorter interval. This is the result aimed at by physicians who endeavor to bring about the death of the fœtus by injections of morphine or by electricity. If the fœtus die at a later date, it acts as a foreign body, and may become encysted and transformed into a lithopædion, as we shall see later, or may provoke the symptoms which accomplish its elimination.

Finally, the fœtus may live to term. This occurs, as a rule, when the tube distends or bursts open laterally, the expanded surfaces of the broad ligament protecting the included fœtal cyst from rupture into the abdominal cavity (subperitoneal variety).

In such cases we have at term the curious symptoms described as false labor, when, if art do not step in to assist nature, the child dies. If the woman survive, we have a train of phenomena common to all the varieties of ectopic gestation reaching term, to which I shall later recur.

Tubo-Uterine or Interstitial Pregnancies.—Here the ovum is developed in the very short portion of the tube which is included within the uterine walls. A part of its surface is free, and separated from the peritoneal cavity by false membranes only. These cases are of rare occurrence; the statistics in regard to them have been collected by J. Baart de la Faille.[13] When the fœtal cyst ruptures, there may be a hemorrhage escaping by the natural passages. The placenta and fœtus may follow, or may be discharged into the peritoneal cavity. The duration of pregnancy is usually longer than in the tubal form; it may go on to term,[14] but may also be terminated by fatal hemorrhages before the fourth month. Schultze[15] considers that interstitial pregnancy is very frequent and often unrecognized, and that numerous abortions in supposed normal pregnancies could have had no other origin.

Tubo-Abdominal Pregnancy.—The ovum here develops at the distal extremity of the tube; it is but partially enveloped by it, the external portion of the sac being covered by false membranes. It is adherent to neighboring parts—the broad ligaments, ovaries, mesentery, intestines, bladder, and even, if the cyst attain a sufficient size,

the spleen, kidneys, and liver. The placenta is usually situated in the pelvis. The ovary may be flattened and incorporated with the walls of the cyst, in which case the pregnancy is termed tubo-ovarian. The possible extension of the cyst toward the abdominal cavity by successive additions of false membranes explains the occasional postponement of rupture to term.

Many cases of so-called tubo-ovarian or even ovarian pregnancy cannot be explained upon general principles, but require special demonstration. Vulliet,[16] not without some reason, has maintained that in some cases the pregnancy is developed within a pre-existing

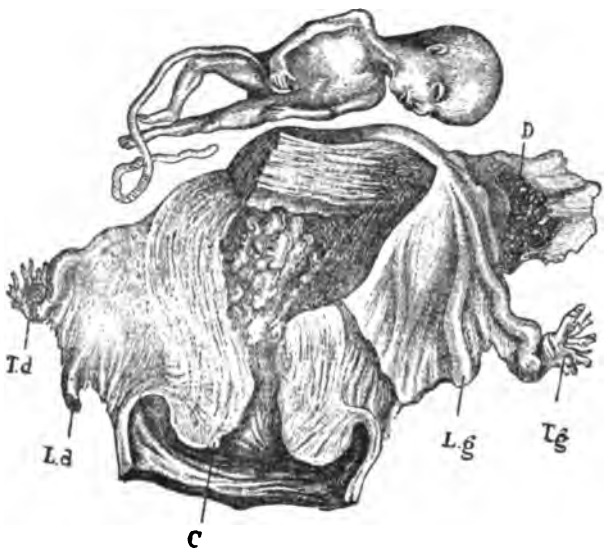

FIG. 65.—INTERSTITIAL PREGNANCY; RUPTURE. *D*, Tear; *C*, cervix; *Td*, *Ld*, right ovary and round ligament; *Tg*, *Lg*, left ovary and ligament. (Fœtus of nearly four months. The woman had an attack of vomiting in the evening, and died the following day from internal hemorrhage. Specimen belonging to Professor Hoffmann, and placed in the Medico-Legal Museum of Vienna.)

tubo-ovarian cyst. He calls to mind the fact that Burnier[17] demonstrated the presence of Graafian follicles in the wall of a tubo-ovarian cyst removed by Schröder, and argues that therefore impregnation is possible in the neighborhood of these cysts.

Upon Burnier's demonstration and upon a case observed by himself, he bases his assertion that pregnancy may develop within these cysts, distending them in the same way as contained fluid would do. The possible growth of the fœtus to term appears to him to be thus explained. Paltauf[18] has since published a confirmative case.

Ovarian Pregnancy.—The existence of this variety has been con-

tested; many of the cases claimed for it have been proved to be cases of tubo-abdominal pregnancy with intimate but secondary adhesions to the ovary. It is, however, not impossible that impregnation should occur in a ruptured Graafian follicle in such a way as to cause the insertion of the placenta upon the ovarian tissue; but these cases are of rare occurrence. In the very full collection of the Museum of Vienna, Bandl [19] found only one specimen of ovarian pregnancy, and almost questions the possibility of its existence. Puech,[20] it is true, quotes a number of cases; but, as I have already said, ovarian tissue in the walls of the cyst does not establish a sufficiently accurate anatomical diagnosis,[21] as intimate secondary adhesion of the ovary may account for its presence.

According to Hueppe,[22] we must admit the following processes in order to explain ovarian pregnancy: Impregnation upon the surface of the ovary, after which either the follicle closes and the fœtus is developed within the ovary after the manner of a cyst, or the follicle remains open, and the fœtus escapes, the placenta remaining behind in the ovary.

Besides these two varieties of ovarian pregnancy, Hueppe admits a third or external ovarian pregnancy. In this class, the formation of the placenta is similar to that in cases of abdominal pregnancy, with which it is apt to be confounded.

Patenko [23] has observed a case in which extra-uterine pregnancy was developed at the expense of the right ovary, which presented the following characteristics: 1. A diminution in the dimensions of the right ovary (length of right ovary, 16 mm.; of left ovary, 35 mm.; breadth of the right ovary, 19 mm.; of the left ovary, 18 mm.) 2. Transformation of a part of the ovary into a cyst. 3. Ovarian structure of the wall of the cavity, demonstrated by a microscopical examination, and finally the discovery of the remains of the fœtus and a trace of a placenta in the cavity itself.

Heinicken [24] regards as ovarian pregnancies only those in which the placenta develops in the interior of the ovary, the fœtal sac developing in the peritoneal cavity. Zmigrodsky [25] admits two varieties—that in which the ovary is the primary and only seat of the ovular development, and that in which, with external development of the pregnancy, intimate union occurs between the placenta and the ovarian tissue. Generally speaking, he says, the site of the placental attachment plays the chief rôle in the classification of extra-uterine pregnancy. A distinction should be observed between simple adhe-

sion of the fœtal sac to the ovary and organic connection of the placenta with the ovarian tissue.

Werth[25] says that a study of ovarian pregnancy has given him but one positive indication, but that this indication is of the most pronounced diagnostic value, and is as follows: When the fœtal sac springs unmistakably from the appendages, while the condition of the Fallopian tube excludes the possibility of its participation in its formation, the conclusion is inevitable that we have an ovarian pregnancy. Mouratoff[27] has reported a case in which ovarian pregnancy was satisfactorily demonstrated.

Abdominal Pregnancy.—When the ovule falls into the peritoneal cavity and is there impregnated, it may attain complete development in that situation. As a usual thing, it becomes surrounded by a pseudo-membranous sac, which may become greatly thickened by the addition of successive layers, and may firmly adhere to neighboring organs. In some rare cases, the fœtus is enveloped in a thin, transparent membrane. A condition of extreme vascularization is found in the viscera in contact with the ovum. There is nothing corresponding to a decidua, as there is in tubal pregnancy.

The placenta has no regular form and may attain enormous proportions. It is reported that in the course of a laparatomy performed for ectopic gestation, Gaillard Thomas[28] was asked by one of his assistants whether the placenta which he was extracting were not the liver, so greatly did it resemble that organ.

Where compression does not strangulate the ovum, its development is, as a rule, not interrupted by rupture or hemorrhages, but goes on to term. The placental circulation may sometimes be continued after the death of the fœtus, and cause fatal hemorrhage.[29] Ordinarily, however, this circulation ceases gradually, and is completely abolished about two months after the death of the embryo. It has been claimed[30] that abdominal pregnancy is always secondary and consecutive to rupture of a tubal pregnancy. It is probable that this is its most frequent origin, but several well-authenticated cases establish the existence of primary abdominal pregnancy.[31]

Pregnancy in a Rudimentary Horn of the Uterus.—Cases of this class, as Kussmaul[32] has well shown, have often been mistakenly diagnosed, and erroneously attributed to tubal pregnancy. The first well-described case is that of Dionis. Sänger[33] has collected all the statistics bearing upon the subject up to the year 1884; the cases are 29 in number, to which Bandl[34] added the thirtieth. Of these 23 ter-

minated by rupture in the first six months, 3 by calcareous degeneration, while 4 were treated by means of laparatomy. It may be difficult, even at autopsy,[25] to determine whether the cyst is developed in the tube (interstitial variety) or in a rudimentary horn of the uterus. The diagnosis is of course impossible upon the living subject. The difficulty lies in the fact that the tumor developed in a rudimentary horn is separated from the rest of the uterus by a species of pedicle (Fig. 66).

Careful examination will show certain characteristic relations between the tube and round ligament and the fœtal cyst. In tubal pregnancy, the tube is greatly shortened, reduced to its uterine seg-

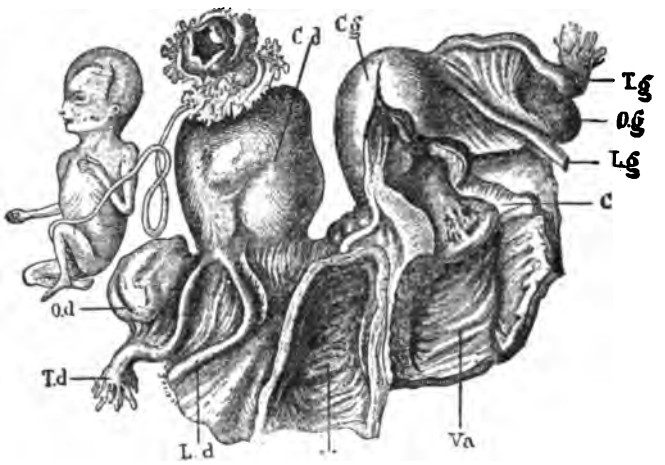

FIG. 66.—ECTOPIC PREGNANCY IN A RUDIMENTARY HORN OF THE UTERUS. RUPTURE. *Cd*, right horn, closed at the proximal end, seat of the pregnancy (at the upper part of this horn is seen the tear); *Od*, right ovary; *Td*, right tube; *Ld*, right round ligament; *Cg*, *Og*, *Tg*, *Lg*, left uterine horn, ovary, tube, and round ligament; *Va*, vagina; *V*, bladder. (Fœtus of three months and a half; mother died of internal hemorrhage in six hours. Specimen belonging to Professor Hoffmann, placed in the Medico-Legal Museum of Vienna.)

ment, while the round ligament is found in the internal portion of the sac. When, on the contrary, the rudimentary horn becomes gravid, the tube maintains its normal length, and its insertion, as well as that of the round ligament, is found to be external to the sac.

Condition of the Uterus in Extra-Uterine Pregnancy.—The changes undergone by the uterus furnish one of the most curious characteristics of extra-uterine pregnancy. There is a general hypertrophy of the organ with increase in the size of its cavity; at the same time, according to Ercolani and Langhans, the mucous lining undergoes modification similar to that of a gravid uterus; a plug of mucus obliterates the cervix.

The nearer the ovum is to the uterus, the more marked are these changes.

They are evidently of a mixed character, and due to reflex or sympathetic trophic phenomena, analogous to those produced in the breasts, and also to the increased pelvic circulation. Hennig has noted a few exceptions to the rule.

The location of the uterus varies with that of the ovum. At the third or fourth month the latter is usually in the cul-de-sac of Douglas, and the uterus is displaced more or less anteriorly or to the side, as can be demonstrated by external palpation.

The ovary upon the same side as the embryo usually contains a large corpus luteum, the origin of which has formed the subject of many discussions.

Cases have been reported in which a normal and extra-uterine pregnancy coincided.

Anatomical Changes Consecutive to the Death of the Fœtus.—The fœtal cyst may rupture at an early date, with fatal results, or it may give rise to a retro-uterine hæmatocele in which the embyro may become lost, as it were, and unrecognizable. If the fœtus reach term, its life may be a trifle prolonged beyond the usual limit, but it eventually dies. One of two things will then happen: either its presence is not tolerated, and a train of symptoms is produced which result in the death of the mother or expulsion of the fœtal débris; or the foreign body is tolerated and undergoes fatty or calcareous degeneration. The calcified fœtus, which sometimes remains for years imbedded in the tissue, is called a lithopædion.[36]

Symptoms of Ectopic Pregnancy.—The patient may present all the signs of an ordinary pregnancy, and not suspect that there is any abnormal condition. On the other hand, from the outset, any of the usual symptoms may be absent, or so slightly marked that pregnancy is not recognized. Thus, the usual swelling of the breasts may not occur. Menstruation may at first disappear, and then return, sometimes even assuming the character of continuous menorrhagia. Expulsion of a decidual membrane and increase in the size of the abdomen are symptoms which usually awaken suspicion, yet in the majority of cases the abdominal enlargement is very slight when rupture occurs at the second or third month. This accident may occur at a time of apparent health, and, as it may follow eating, is sometimes mistaken for poisoning. The recognition of this possibility is of extreme importance from a medico-legal standpoint.[37] The symptoms

are those of internal hemorrhage, sometimes of a rapidly fatal character.

The attack may recur, in which case death is usually produced after two or three seizures, or even more remotely by successive hemorrhages.[38] The signs of internal hemorrhage and of hæmatocele consequent to rupture, having already been clinically described, need not here be dwelt upon (see chapter on Intra-Peritoneal Pelvic Hæmatocele).

When pregnancy goes on to term, as is often the case in the intra-ligamentous and abdominal variety, we frequently find symptoms of compression of the bladder and rectum, and phenomena due to successive inflammatory attacks. The patient is usually kept in bed by fever and constant pains. Freund has directed attention to the intestinal colic and diarrhœa as a feature of extra-uterine pregnancy. These symptoms indicate irritation of the intestine by the adhesions between it and the fœtal cyst. Intestinal occlusion may be present, due to compression of the rectum.[39] The pains take on an expulsive character at a period more or less remote from the time at which labor would normally occur. The cyst may rupture into the abdominal cavity, and the patient succumb to acute or chronic peritonitis, which sometimes takes on the character of septicæmia.[40] If this crisis be safely passed, a stage of tolerance of the foreign body may be entered; yet this period is not altogether to be trusted, since grave inflammatory symptoms may occur, even after all danger seems averted. A lithopædion dating back sixteen years has been known to cause intestinal obstruction and peritonitis;[14] these bodies have also been eliminated by the rectum, after the lapse of periods varying from one to forty-three years.[42]

In other cases, the rupture, instead of occurring into the abdominal cavity, occurs within the folds of the broad ligament. The hemorrhage is less in amount, limited in extent, and the resulting symptoms are less severe. Further, if the life of the fœtus is not compromised, this exra-peritoneal development of the ovum is more favorable to success in the event of operation. Finally, in extremely rare cases, rupture occurs into the uterus itself; the conditions of this result are a tubo-uterine or an interstitial pregnancy.[43] Spontaneous expulsion of the fœtus may occur by suppuration of the cyst and evacuation of its contents. The fœtus reduced to its skeleton or to a shapeless mass of débris is, as a rule, expelled through an abscess in the abdominal walls,[44] or by a perforation of the rectum.[45] More rarely,

perforation is into the vagina[46] or the bladder,[47] and without operative interference may give rise to endless suppuration.

Diagnosis.—For purposes of diagnosis extra-uterine pregnancy is divided into two stages, each one of which is marked by typical signs.

1. *Embryonal Period, extending from the Commencement of Pregnancy until Quickening.*—This stage is the one which is the more frequently met with, and also the one which presents the greatest diagnostic difficulties, which, however, have but slight importance from the standpoint of treatment, as we shall see later. This period corresponds to the first four or five months of fœtal life, but in the event of the death of the fœtus it may be prolonged much beyond this time without appreciable modification of its conditions, unless some accident supervene, such as rupture or inflammation of the cyst.

The rational signs present no striking characteristics; they consist of symptoms more or less marked, referred to the genital organs. Menorrhagia may be present, necessitating the tampon;[48] in other cases menstruation may be undisturbed;[49] in still others, all of the signs of normal pregnancy may be present—suppression of the menses, changes in the breasts, and sympathetic disturbances of the digestive and nervous systems. On examination, however, the size of the uterus will be found not to correspond with the stage of pregnancy thus indicated.[50]

Colicky pains followed by expulsion of a decidual membrane will often point to disturbance in the life of the ovum, and indicate death of the embyro. Yet this occurrence, especially if accompanied by metrorrhagia, may at times falsely lead to a diagnosis of abortion, as pregnancy may persist. If such be the case, we unquestionably have to do with ectopic gestation.

Pain due to intestinal adhesions characterizes tubo-abdominal and abdominal pregnancy. When the ovum is incarcerated in Douglas' pouch symptoms of compression of the rectum or bladder are often manifested. The ovum then is often mistaken for a fibroid tumor of the posterior wall of the uterus.

Bimanual palpation may reveal the ovum at the side of the uterus, sometimes continuous with it, but sometimes separated by a sulcus or a pedicle. It constitutes a tumor which in no wise differs from the usual tubal cyst—the hydro-, hæmato- or pyo-salpinx.[51] If we succeed in mapping out the body of the uterus, we shall find it somewhat increased in size and displaced laterally; the cervix will not be perceptibly changed. When the tumor occupies the cul-de-sac of

Douglas (which is of rare occurrence), it is there encysted, and ballottement after the fourth month may decide the differential diagnosis. Retroversion of a gravid uterus is apt to be suggested in such a case, and mistakes are probable. Either a diagnosis of retroversion is made where extra-uterine pregnancy exists or a diagnosis of extra-uterine pregnancy is made when really a retroversion is present. The sound is sometimes used to establish the diagnosis in these cases. In a case of Bailey's, however, with reroversion it penetrated but eight centimetres. Another sign may be incidentally of value: in the case of the fœtal cyst, examination never excites contractions, while these may be sometimes obtained in the bimanual examination of the gravid retroverted uterus.[52]

Rectal touch completes our evidence in regard to the size and relations of the tumor. Such examinations should be conducted with the greatest gentleness, on account of the danger of inducing rupture and serious hemorrhage.[53] The passage of the uterine sound should be totally prohibited for the reason that it provokes contraction of the uterus and tubes.[54]

Diagnosis between extra-uterine pregnancy and pregnancy in a rudimentary horn of the bifid uterus is impossible upon the living subject; it is made with difficulty even in the cadaver, in spite of the modifications produced by the development of the fœtal cyst.[55]

The diagnosis of rupture is easy when the signs of internal hemorrhage become apparent. As to the death of the fœtus, that may be suspected when, after expulsion of a decidual membrane, the sympathetic symptoms of pregnancy gradually disappear. We may get an increase in the sensibility and size of the tumor, corresponding to the hemorrhage into the ovum which occasions the death of the embryo, and, following this, a diminution and induration of the fœtal cyst.

2. *The Fœtal Period properly so-called, Commencing with the Fifth Month.*—The sympathetic phenomena of gestation persist, and are accompanied by abdominal pains, often of so severe a character as to confine the patient to bed. These pains, together with the loss of blood, and the irregular contour of the tumor, with its lateral location, prevent extra-uterine pregnancy of this class from being confused with normal pregnancy. The cervix is also much less softened than in normal pregnancy, while combined manipulation which will allow of the mapping out of the uterus, at least in its inferior segment, will show that it is not perceptibly dilated, and that it is displaced to the side opposite the tumor.

Diagnosis of the variety of the pregnancy is impossible. It was formerly supposed that all extra-uterine pregnancy which passed the fifth month was abdominal, but we know now that tubo-abdominal, tubo-ligamentary, subperitoneal, ovarian, and tubo-ovarian pregnancies may all go on to term. In the intra-ligamentary variety, the tumor is usually surrounded by a thick membrane, while in abdominal pregnancy the fœtal parts are easily felt beneath the abdominal walls. The location of the placenta is indicated by palpation (frémissement) and auscultation (bruit de souffle).

The existence of false labor is determined by expulsive pains. These have been demonstrated in the course of a laparatomy;[56] they are due to the contractions of the uterus at regular intervals as in normal labor. False labor usually occurs precisely at term, sometimes prematurely at the seventh month, and more rarely beyond term. It should not be confused with the painful crises associated with the phenomena of rupture.

The death of the fœtus is made evident by loss of the heart sounds, by increase in the volume and softening of the tumor due to venous thrombosis with subsequent transudation of fluid, and by the appearance of milk. If the fœtus is tolerated, there now begins a work of mummification transforming the ovum into a solid adherent tumor, which in the absence of history might be easily confused with a fibroid of the uterus, an old pelvic hæmatocele, a tumor of the ovary, a dermoid cyst, or a cancer of the peritoneum, etc. The evidences of pregnancy not followed by labor should be examined with the greatest care. In the case of doubt, or if serious symptoms develop, we may perform laparatomy, which may be merely exploratory, and will sometimes permit us to determine exactly the nature of the cyst and its relations; also whether it can be removed directly or whether it can be better attacked from another direction.[57]

The fistulæ consecutive to a suppurating fœtal cyst may be diagnosed by the débris of the skeleton which pass through them or which may be reached through these channels after dilatation.

Finally we sometimes have to make a diagnosis of the complications of this condition. I will refer you to the treatises on obstetrics[58] for those exceptional cases in which extra-uterine pregnancy, recent or remote, has complicated uterine pregnancy; for the cases of old extra-uterine pregnancy complicating that of recent date; and finally, for the cases of extra-uterine pregnancy complicated by hyramnios.

Prognosis.—During the first half of extra-uterine pregnancy, rup-

ture constitutes the greatest danger; according to statistics, the patient usually succumbs. On the other hand, the operation for the removal of the fœtal cyst is of slight gravity at this period. It may be said that the prognosis is serious only in those cases in which the tumor is not recognized and extirpated. The condition of things in the second period is totally different. The condition in itself is grave, the question of treatment is also serious, for this becomes more hazardous as we approach term, when hemorrhage is most to be feared. It is impossible to determine from statistics the fatality of this condition when not interfered with. Spontaneous recovery has been most often effected through the elimination of the cyst by suppuration, and this process is less or more serious according as it is or is not methodically and antiseptically treated. The results are known in 499 out of 500 cases collected by Parry. In 336 the patient succumbed, in 163 she recovered; giving a general mortality of 67.2%.

According to Himmelfarb,[59] pregnancy in a rudimentary horn of the uterus is very serious in its results if left to itself. It is probable, however, that many of these cases are undiagnosed when the abortion occurs in the early months before the fœtus has attained a size which makes expulsion through the strait separating the sac from the uterus impossible.

Treatment.—One chief fact is to be borne in mind regarding the treatment of extra-uterine pregnancy; namely, that every stage of the development is attended with formidable danger: Hemorrhage threatens in the first period, peritonitis and septicæmia in the second, while internal suppuration and compression may occur, even after the ovum has been transformed into an apparently inert mass. In view of these accidents, there is reason in Werth's suggestion that ectopic pregnancy is always to be regarded as a malignant growth and treated as such. The rare cases of tolerance or of spontaneous recovery do not authorize expectant treatment.

From the standpoint of the indications, the question of therapeusis is, as has already been stated, very simple. It is reduced to the mere question of operative opportunity and of the technique to be adopted in the extirpation of the fœtus. I cannot, however, pass over in silence certain modes of treatment, some of which are interesting for their historic value, while others are still warmly advocated. These all refer to the first period of ectopic gestation, and are directed to the accomplishment of the death of the embryo, and the promotion of its absorption or its toleration by the tissues.

Among the methods of treatment which are now obsolete I may mention the starvation cure of Ritgen,[60] the administration of strychnine up to its toxic effect by Barnes,[61] the hypodermic injections of ergotin by Janvrin,[62] mercurial inunctions, the administration of iodide of potassium, repeated bleedings,[63] and puncture of the cyst.[64]

Two methods of producing the early death of the fœtus are still employed, and their merits still discussed. These are the injection of morphine and the use of electricity.

The injection of morphine[65] by means of a hypodermic syringe is recommended before the fifth month. Two injections of the hydrochlorate of morphine of half a grain each at eight or fifteen days' interval[66] are sufficient. We cannot ignore the fact that this method, so seductive in its simplicity and apparent harmlessness, may give rise to grave accidents, as hemorrhage, septicæmia, and perforation of an intestinal loop.[67] Moreover in any case where it might be efficacious, as in the beginning of the pregnancy, laparatomy in the hands of an experienced surgeon is attended with less risk.

Electricity[68] has been employed by the following methods: electropuncture, galvanization, and faradization. The latter only is in use at the present time. The negative pole is applied to the rectal or vaginal mucous membrane in the neighborhood of the ovum. The positive pole is applied by means of a large electrode to the abdominal wall an inch or more above Poupart's ligament. The current is passed for five or ten minutes, the strength being progressively increased according to the sensitiveness of the patient, and the treatment is repeated if necessary.

This method has been very popular in America;[69] it has also its ardent advocates in Russia.[70] It is very difficult, however, to arrive at any true idea of its value, as exactitude of diagnosis is impossible, and as most of the reports in regard to its results have been made by practitioners whose authority is not established.[71]

The treatment is far from being without danger, for, besides encouraging temporizing in the presence of a condition which menaces life, it is itself capable of exciting tubal contractions and causing rupture. Brothers has reported two cases of death. Janvrin[72] quotes a third.

[It is doubtful if the use of electricity *without puncture* has directly caused the rupture of the fœtal sac or the death of a patient. I fully indorse the views of Byford, who in the *American Journal of Obstetrics*, November, 1891, states: If we have a case of extra-uterine

pregnancy in the early months it is safe to destroy the fœtus by electricity and keep the patient in bed until absorption has noticeably commenced. If rupture have occurred without serious hemorrhage, and a well-defined hæmatocele be discovered, we may put her to bed, diet her, keep her quiet, and wait, being at the same time ready for a laparatomy. If profuse, repeated hemorrhages occur, it is safer to operate at once according to Tait's precepts. If development have gone on after the middle of pregnancy, either an immediate abdominal section is indicated, of fœticide with operation later. In the ninth month, and at term, operate in the interests of the child, unless false labor have occurred. After that operate upon the appearance of the first evidence of sepsis.]

Extraction of the Fœtus, with or without the Sac.—This, whether it be accomplished by laparatomy or elytrotomy (vaginal incision), is, as I have said before, the procedure which is gaining in favor, as applied to all the stages of extra-uterine pregnancy. In order to place the indications, however, and to show their relations to the individual case, classification is indispensable.

1. *Pregnancy before the Fifth Month without Rupture.*—As at this period we can obtain no certain signs of pregnancy, action must be based upon not much more than a suspicion of the nature of the case. To justify laparatomy [73] it is sufficient for us to know that we have a painful tumor of the appendages. The operation at this time does not differ materially from that for the extraction of serous, bloody, or purulent cyst of the tubes, the majority of extra-uterine pregnancies being tubal in origin; this frequency is such that Lawson Tait [74] goes so far as to deny the existence of any other variety. A single distinguishing feature in the technique of these operations refers to the danger from hemorrhage in case of rupture of the cyst during the efforts at extraction. This accident, which may be fatal, has been noted by several authors.[75]

In operating for a non-pediculated tumor such as is found in intra-ligamental or subperitoneal pregnancy, which is in fact a species of included cyst, we dissect out the cyst, incising the serous capsule at a point free from blood-vessels, rapidly placing artery forceps where needed. The placenta is removed at once, in order to avert the profuse hemorrhage which might occur, even at this early stage.[76] Tamponing the cavity with iodoform gauze may also be of service.

Extirpation of fœtal cysts of the tubes during the first three months has been practised frequently of late, and the reports of

societies show that such operations are becoming more and more numerous. They are not dangerous: Lawson Tait has had a series of 43 successful cases; Veit reports 12 recoveries out of 15 cases.[77]

Elytrotomy has been performed during the first four months of extra-uterine pregnancy,[78] but it is inferior to laparatomy in that it does not afford room for the control of hemorrhage.

2. *Pregnancy before the Fifth Month, complicated by Rupture and Grave Internal Hemorrhage.*—The question of treatment in these cases is no longer subject to the uncertainty which surrounded it a few years ago. When hemorrhage from an external wound or from an internal rupture threatens the life of a patient, we must at once seek its source. Temporizing, waiting for spontaneous hæmostasis, is in the great majority of cases to abandon the woman to her death. The responsibility of operating in such a case is a much less serious alternative, for, if the patient do not succumb from shock, she will die from a second or a third attack of hemorrhage or from the complications of the resulting enormous hæmatocele. The cases in which spontaneous recovery has justified such an excess of caution on the part of the physician are rare.

Keller[79] in 1872 formulated the preceding rule. Its demonstration, however, belongs to Lawson Tait,[80] who has had recovery in 40 out of 42 cases. It is true that in only twelve of these cases could the fœtus be found, but in the remaining cases the placenta rendered the diagnosis of extra-uterine pregnancy certain. His example has been followed in America and Germany. Schwarz[81] recommends in this connection that we remove the whole of the blood, not placing any dependence upon the absorptive powers of the peritoneum, but rather in the case of profuse hemorrhage, fearing the depressive influence upon the nervous system of the accumulated clots. Hæmostatic tamponing of the peritoneal cavity with iodoformed gauze should be used if necessary.

3. *Pregnancy beyond the Fifth Month, the Child being Alive.*—These cases of course assume a large degree of importance, but great difference of opinion exists in regard to them on the part of different authorities. Some have in mind an operation which will save both the mother and child; while others are occupied exclusively with the mother and the more or less pronounced danger which attends interference with the placental circulation when it is in an active condition. The fœtus is a negative quantity in the problem, for, they argue, as it is probably deformed, rarely viable, its preservation should

not weigh in the balance when it endangers the mother's life,[82] and the latter is the only factor to be considered.

The partisans of primary operation, on the other hand, say[83] that, in the case of operation after the death of the fœtus, if the woman is less exposed to the danger of hemorrhage, she is more exposed to that of septicæmia, the likelihood of which increases rapidly during the two months necessary for the cessation of the placental circulation, this being the time assigned by the advocates of the expectant treatment.

On the whole, the vitality of the ectopic fœtus has been greatly underrated. Many cases are known in which it has been perfectly developed. If, then, through the progress of operative technique, the chances for the mother are the same whether the operation is performed before or after the death of the fœtus, the first period is certainly the one to be preferred.

We must acknowledge, however, that the results have not thus far been as a whole encouraging. Maygrier,[84] out of 17 cases collected up to 1886, found a mortality of 15 cases, or 88%. In 10 cases the woman died of hemorrhage, either at the time of the operation, from the detachment of an adherent placenta, or later, following the spontaneous detachment of placental fragments. Of the infants, 9 lived only a few hours and the fate of 8 was unknown. Werth[85] has collected 8 cases, published from 1880 to 1886, with 7 deaths for the mother, and 3 only for the child; 2, however, succumbed soon after birth; 2 others were well at the age of three months.[86]

Harris[87] has still more recently collected 30 cases of primary laparatomy, performed, that is to say, before the death of the fœtus. He found up to 1880, 20 cases with 1 success only for the mother and 10 for the child, life persisting for a variable period. From 1880 to 1886 he found 10 cases with 4 successes for the mother and 6 for the child.

At the present time, however, the aspect of the question is changed. Operations are now, as a rule, successful, as witness the following statistics, gathered by me since those of Werth in 1886. Lazarewicz,[88] Breisky,[89] John Williams,[90] Eastman,[91] Olshausen,[92] Braun von Fernwald,[93] Treub,[94] Lawson Tait,[95] have all operated a little before term, or at term, and have saved both mother and child. The last-named, out of three operations, saved all the children and two of the women. Champneys[96] saved the child only. Joseph Price[97] lost both, but he operated in the presence of peritonitis due to rupture of the sac.

Hildebrandt[98] operated upon two moribund cases, but succeeded in saving one child.

G. Beisone[99] lost the mother, but saved the child. Excluding the cases of Price and Hildebrandt, which were desperate, we have, as a result of 13 operations, 9 living women, and 11 children who lived for at least a few days.

This success seems to be due principally to the improved technique of the operation, and in particular to the complete ablation of the sac and of the placenta. We can see here, as in all laparatomies, how we may with experience surmount operative difficulties. We see also the evident exaggeration of those persons who consider the ectopic fœtus necessarily doomed on account of deformities or congenital feebleness. Even when this feebleness exists, we know that we have resources in "gavage" and the "couveuse" by which we may at the present time save the child who in other days would have been lost. We may now perform laparatomy with the expectation of saving two lives. It is preferable not to wait for the phenomena of false labor, because the fœtus then succumbs very rapidly. According to the recommendations of Fraenkel we may decide upon the time for intervention by the volume of the fœtus as determined by external examination and palpation; the operation is usually preferably done during the first two weeks of the ninth month.

In regard to the choice of methods, laparatomy is as a rule indicated, for it permits us to cope with the operative difficulties which present themselves. We would not, however, entirely proscribe elytrotomy. If on vaginal examination we do not find the placenta, and if the fœtus be deeply engaged in the pelvis, elytrotomy may be preferable even as affording drainage for the placental wound which will be probably located upon the anterior wall of the abdomen. This situation may be assured if on auscultation the placental bruit is found synchronous with the maternal pulse.[100]

At the inception of false labor the woman should be kept absolutely quiet and the pains should be controlled by injections of morphine or enemata of laudanum. Operation at this period will be ill-timed, at least unless the phenomena of grave internal hemorrhage make it necessary.

Pregnancy beyond the Fifth Month, the Child recently Dead.—The question of laparatomy immediately after the death of the fœtus is, by the majority of foreign authors, and unanimously by those of our own country, answered in the negative.[101] Parry advo-

cates indefinitely expectant treatment, and trusts to the transformation of the fœtus into a lithopædion and to its spontaneous elimination. This doctrine was also held by Tarnier and Budin. Litzman, Werth, Maygrier, and Pinard [101] give a less absolute rule, but, influenced by the older statistics and fear of hemorrhage, advise waiting until the obliteration of the placental circulation. The time required for this obliteration is uncertain; for while it has been approximately given as two months, alarming hemorrhage has been known to follow detachment of the placenta at the end of three months,[102] so that the delay has not only permitted the death of the child, but has also exposed the mother to new dangers. Many of the deaths following secondary operation, that is to say, an operation which has of deliberate purpose been delayed, may be attributed to the expectant treatment, since intercurrent septicæmia or peritonitis often fatally complicate the surgical intervention which a few months previously could have been undertaken under the most favorable conditions. In consideration of the results obtained in recent cases of primary operation (laparatomy) we shall be authorized, I think, in reforming the dictum which has been set down by our predecessors and adopted as a rule. Here, as in all of the problems of abdominal therapeusis, the theoretical objections of the timid surgeon fall before the results of a bolder practice characterized by good technique.[103]

The advent of fever and the prodromata of septicæmia, instead of contra-indicating operation, but render it more urgent. In even such cases the patient has been saved.

5. *Pregnancy beyond the Fifth Month, the Child having been Dead for a Considerable Time.*—If the death of the fœtus has been remote and toleration seem to have been established, and there is a prospect of its transformation into a lithopædion, is it wise to interfere and to subject to the dangers of laparatomy a woman who is otherwise in good health? I believe that even in such cases operation is indicated, in view of the future. It is an established fact that the tolerance accorded to the ectopic fœtus is always precarious, and that decomposition of the ovum with infection and consecutive peritonitis may supervene at any time before the fœtus is entirely transformed. Even after the change has been completed, infection may occur, and be followed by expulsive efforts due to suppuration, causing grave complications and great danger.

6. *The Old Suppurating Fœtal Cyst, with or without a Fistula.*—It is apparent that here we have simply to assist the work of nature.

If an abscess exist we should open it, whether it point toward the abdominal wall,[105] the rectum, or the vagina, and explore for the fœtal bones. We are sometimes aided by the existence of a fistula, allowing the use of a probe, which can be carried into the little skeleton and serve as a guide for the incision. These operations compare favorably with those for the extraction of the fœtus by laparatomy. They are without danger if care is used to secure antisepsis in the matter of the sac, which is generally very foul.

I have had occasion to remove by the rectum the whole of the skeleton of a fœtus in a case where spontaneous efforts at elimination both by rectum and vagina had failed. Sloughing of the septum from the pressure of the sac had resulted in a recto-vaginal fistula. The patient was seen in the service of Gallard. She recovered rapidly, thanks to regular antiseptic injections of the cavity of the abscess, which was very fœtid. Out of 23 cases collected by Parry, of suppurating fœtal cysts of long standing, only 3 ended fatally.

7. *Pregnancy in a Rudimentary Uterine Horn.*—If abandoned to themselves, cases of this kind give a mortality of twenty-three out of fifty during the first six months (Bandl). The indication here is to interefere by laparatomy. The operation is much more simple than in the preceding class of cases, and has been successful in five out of six cases, performed either at term or long after. The horn of the uterus is removed, just as is the case with the entire uterus in Porro's operation. A patient of Sänger was twice normally delivered after such[106] a procedure.

Technique of Extraction by Laparatomy.—I do not here intend to describe every detail of the operation, since the rules already indicated in the chapters on Hysterectomy and Ovariotomy are applicable here as well. I merely wish to draw attention to a few special points relative to the difficulties to be expected.

Hemorrhage is the complication most to be feared where the pregnancy is advanced and the child is alive or but recently dead. To guard against this danger in choosing a place for opening the sac, we must avoid the situation of the placenta. If on examination of the relations we find total removal of the sac difficult, we must give it up and suture it to the abdominal wound. Traction on the cord or placenta should be avoided. The best medium for controlling hemorrhage is the tampon of iodoform gauze. Whatever the cause of application, the loose tampon of iodoformed gauze may be left in position without fear of decomposition for three or four days. Where used

to combat hemorrhage, it should not be removed before the eighth day.

Infection of the peritoneum by the contents of the cyst is to be guarded against in cases where we operate after the death of the fœtus and where the patient has fever indicating septic absorption. We should try to remove the sac entire without opening it. If we cannot avoid an incision, it will be better not to dissect out the sac, as the raw surface left by this procedure is exposed to infection from the septic contents.[107]

A. Retention of the Cyst.—Where enucleation of the sac without incision is difficult, it is advisable to tampon down the abdominal wound over the sac with iodoformed gauze and to postpone the opening of the cyst for several days in the hope of the formation of bands of adhesion which will unite it to the abdominal wall. If the situation is urgent and does not permit this delay, we may before opening the sac unite it to the layers of the wound by a line of sutures or by a rapidly inserted continuous suture. In placing these sutures which unite the abdominal wall with the sac, care should be taken not to penetrate into the interior of the cavity, but to carry the needle through the superficial layers only of the wall of the sac. Incision should be followed by delivery of the fœtus by the feet, and division of the cord between two ligatures. We should then thoroughly cleanse the cavity with a solution of corrosive sublimate (1: 2,000) or if preferred a saturated solution of naphthol (Pinard);[108] explore the bottom of the sac and, if it reach the neighborhood of the vagina, introduce a forked drainage tube, passing the longer branch through the posterior vaginal cul-de-sac. The placenta may be mummified by the use of a mixture of tannin and salicylic acid or powdered benzoate of sodium.[109] Iodoform gauze is to be kept in the sac, and drainage carefully attended to. Cicatrization takes place slowly by granulation. The placenta comes away in fragments.[110]

Martin [111] has a treatment of the sac analogous to that which he uses after the enucleation of intraligamentary fibroid tumors (Fig. 164, Vol. I.). He removes as large a part of the wall of the cyst as possible and sutures the remainder, so as to completely isolate the interior of the cyst from the peritoneal cavity, and drains through the vagina.

B. Total Extirpation of the Cyst.—This is a most important modification in the operative technique. The treatment by suppuration of the sac is comparable to that of certain adherent ovarian cysts. It is very tedious, and may result in a permanent fistula,[112] besides expos-

ing the patient to the danger of hernia. Litzmann[113] first proposed to entirely remove the sac with its contents, the fœtus and placenta, so as to favor rapid recovery as after the removal of hæmato- or pyosalpinx. This procedure, called the radical operation, did not, however, at first give as good results as that by retention of the sac. Maygrier, in 1886, knew of only 7 cases of extirpation of the sac. Werth, out of 11 cases collected in 1886, notes 7 recoveries and 4 deaths, or a mortality of 36%; while out of 40 cases with retention of the sac, there were 14 deaths and 26 recoveries, or a mortality of 35%. Later the operation has given a series of remarkable successes with a living child. In several of these cases adhesions inplicating the intestines did not preclude recovery. Werth,[114] who has collected a more recent series, embracing cases of laparatomy for pregnancy at term published since 1887, has out of 9 operations only 1 without extirpation of the sac. This series has only 2 deaths. I have myself a larger list, including statistics for the last two years, completing by continuity the series of Maygrier and of Werth in his first great work. Many cases have undoubtedly escaped me; yet I have found 18 cases of extirpation of the sac (1887 to 1889), with 16 recoveries, 1 death, and 1 result unknown. Of operations for the extraction of the living child I have already cited the 4 cases of Lazarewicz, Breisky, Eastman, Olshausen, and Traub. The others, in which the operation was done after the death of the child, and before or at term, are as follows: Hofmeier,[115] 1 case, with a fatal result; Kusnetzky,[116] 2 cases, recovery; Sutugin, 2 cases, with recovery; Muratow, 1 case, with recovery; Sajaïsky, 2 cases, with recovery; Kadjan, 1 case, with recovery; Slavjansky, 1 case, with recovery; Quénu,[117] 1 case, with recovery; Wiedow,[118] 1 case, with recovery; and Olshausen,[119] 1 case, the result not indicated.

Technique.—Definite rules for the technique of this procedure cannot be given. In its main features it resembles operation for the extirpation of an adherent ovarian cyst or for a parovian cyst included within the broad ligament. The principal operative stages are, however, as follows:

1. Abdominal incision with provisional sutures uniting the sac to the lips of the abdominal wound.

2. Opening of the sac at its thinnest portion, avoiding vessels if possible or seizing them as they are divided.

3. Extraction of the fœtus by the feet, ligature and section of the cord.

4. Removal of the provisional sutures, extraction of the sac by rupture of the adhesions, and enucleation of the subserous portion; forceps should be rapidly applied to bleeding points, the fingers being used to aid in compression if needed.

5. Final hæmostasis of the base of the sac by ligature or the tampon of iodoformed gauze. Even where the tampon is not employed, it will be wise not to entirely close the abdominal wound, but to maintain drainage from the lower portion either by a rubber drainage tube or several strips of antiseptic gauze. If the sac is strongly adherent to the intestine, we must resect it up to the adherent parts, and continue the tampon of iodoformed gauze of the base of the sac until complete exfoliation of the retained portions of the cyst.

Technique of Extraction by Elytrotomy.—The vaginal incision was advocated by Baudelocque.[120] Maygrier,[121] in 1886, collected 4 cases of elytrotomy in the second part of pregnancy, the fœtus being alive. These presented 2 recoveries, 1 doubtful, and 2 deaths, or a mortality of 50%. The same operation with a dead fœtus has given 7 recoveries and 5 deaths, or a mortality of 38.5%. This operation, in my opinion, should be reserved only for cases in which the fœtus is dead. We cannot, in the absence of reliable reports,[122] assert that it is dangerous to the living child, but *à priori* this would seem to be the case from the danger of hemorrhage. In laparatomy, hemorrhage can more readily be controlled. It is altogether different where the fœtus is dead. Here elytrotomy is to be preferred where the cyst is impacted in the pelvis, the placenta not being accessible by the vagina, and the bladder and uterus displaced laterally. The first condition only constitutes the real indication, for the presence of the placenta in the vaginal cul-de-sac causes no real danger after the expiration of about two months when the fœtal circulation has ceased.

The following is the technique observed by Pinard:[123] The woman is anæsthetized and placed in the obstetrical position. After exploration of the vaginal cul-de-sac, puncture is made with a bistoury at a point distinguished by absence of arterial pulsation. The finger is introduced through this incision, which is enlarged by tearing and dilatation accomplished by the fingers introduced as a cone. The hand having entered the opening, the fœtus is grasped by the feet, which are brought to the vulva. By slow and continuous traction, the breech and the trunk are made to engage; the two arms and the head are then delivered.[124] The cord is secured and the placenta is removed if it can be easily detached. If, however, there appear to be adhe-

sions, it is left in place. The interior of the cyst should be irrigated with a solution of corrosive sublimate (1: 5,000) or a saturated aqueous solution of naphthol β. I am inclined to think that the introduction of iodoformed gauze is preferable to the frequent injections recommended by Pinard. The gauze may be renewed every three or four days, or even be allowed to remain undisturbed much longer. Should phenomena of septic infection [125] supervene, we could resort to the continuous irrigation, which has given such good results in puerperal septicæmia.[126]

Spontaneous elimination of the suppurating sac through the bladder is very rare. Winckel,[127] in a recent work, has collected only 12 published cases. Laparatomy, the vaginal incision (P. Müller [127]), elytrotomy, the sub-pubic (Werth [128]) incision, have all been tried. These operations can be, as a rule, avoided. It is sufficient to dilate the urethra (Winckel [129]), or, if necessary to incise it (Littlewood [130]) so as to reach the orifice of the sac with the index finger, to enlarge this, to extract the bones of the fœtus with the forceps, and to cleanse the sac by injections. If it is not possible to treat the condition in this way, or if serious accidents require active intervention, we may resort to vaginal incision followed by immediate suture after the evacuation and disinfection of the sac. The operation through the dilated urethra may be completed in two or three *séances*, with the aid of cocaine. Borated vesical injections should be continued until all traces of cystitis have disappeared.

In cases where a large cyst is firmly impacted in Douglas' cul-de-sac, instead of elytrotomy we may prefer perineotomy either transverse or vertical, or a para-sacral incision, or we may gain access to the pelvic cavity by means of a preliminary resection of the coccyx and a part of the sacrum. It belongs to the future to determine the suitable application of these new operations.

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3. Bandl: Die Krankheiten der Tuben, etc. Deutsche Chirurgie, Lief. 59, 1886.

4. Fasola: Annali di Obstet., Florence, 1888, x., p. 145. The cases had been observed at the Florence clinic from 1883 to 1885.

5. Dezeimeris (Journ. des Conn. Médico-chirurg., January, 1837) proposed this name for one of the thirteen different forms which he distinguished.

6. Hennig: Die Krankheiten der Eileiter und die Tubenschwangerschaft, 1876.

7. Tuttle: New York Obstetrical Society. Amer. Journ. of Obst., Sept., 1889.

8. Slavjansky: Centr. f. Gyn., 1889, p. 834.

9. Hecker: Monatschr. f. Geb., Berlin, 1859, xiii.

10. Hoffmann: Allg. Wien. med. Zeitschr., 1888, No. 25.

11. Kaltenbach: Gesellschaft f. Geb. und Gyn., Berlin, Dec. 14th, 1888. Centr. f. Gyn., 1889, No. 4.

12. Freund: Meeting of German Naturalists and Physicians, Heidelberg, 1889. Centr. f. Gyn., 1889, No. 40.

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14. Spiegelberg: Arch. f. Gyn., 1878, Bd. xiii., p. 73. Leopold: Arch. f. Gyn., 1882, Bd. xix., p. 210.

15. Schultze: Verhandlungen des zweiten Kongresses der deuts. Gesellschaft f. Gyn., p. 231.

16. Vulliet: Archiv f. Gyn., 1884, Bd. xxii., p. 487.

17. Burnier: Inaug. Dissert., Berlin, 1880.

18. Paltauf: Arch. f. Gyn., 1887, Bd. xxx., p. 456.

19. Bandl: Loc. cit. (No. 3), and Obst. and Gyn. Society of Vienna, April 17th, 1888. Centr. f. Gyn., 1889, No. 4.

20. Puech: De la Grossesse de l'Ovaire. Annal. de Gyn., 1878, vol. x.

21. Cohnstein: Arch. f. Gyn., 1877, Bd. xii., p. 355. Patenko: Arch. f. Gyn., 1879, Bd. xiv., p. 156. J. Collet Gurgui: Die Ovarialschwangerschaft vom pathologisch-anatomischen Standpunkt, Stuttgart, 1881. Werth: Beiträge zur Anatomie und operativen Behandlung der Extrauterinschwangerschaft, Stuttgart, 1887.

22. Hueppe: Die Bedingungen der ovarial und abdominal Schwangerschaft. Dissert. Inaug., Berlin, 1876.

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24. Heineken: Ueber Extrauterinschwangerschaft mit Berücksicht. eines Falles von Laparot. bei Graviditas Ovaria, Halle, 1881.

25. Zmigrodzky: Étude sur la Grossesse extra-utérine, St. Petersburg, 1886, abstr. in Centr. f. Gyn., 1888, p. 146.

26. Werth: Beitr. zur Anat. und zur operat. Behandl. der Extrauterinschwang., Stuttgart, 1887.

27. Mouratoff: Étude sur la Grossesse Ovarienne. Annales de Gyn., Feb., 1890.

28. T. Gaillard Thomas: A System of Gynæcology, edited by Mann, vol. ii., p. 181, Philadelphia, 1888.

29. Hart and Barbour: Manual of Gynæcology, p. 555.

30. Mayrhofer: Von der Unfruchtbarkeit des Weibes, Stuttgart, 1878.

31. Schlechtendal (Frauenarzt, 1887, No. 2, abstract in Centr. f. Gyn., 1887, No. 27) observed an abdominal fœtal cyst the size of a fist, situated between intestinal loops which were adherent to the spleen. The tubes were intact, and hence the cyst could not have originated from a ruptured tubal pregnancy. Zmigrodzky (Beiträge zur Lehre der Extrauterinschwang. in Centr. f. Gynäk., 1888, p. 141) collated all the cases of ectopic pregnancy published between 1878 and 1888, and found several cases of averred primary abdominal pregnancy with intact tubes and ovaries, the placenta being implanted far from these organs. The list comprises 198 cases of tubal pregnancy, 18 of ovarian pregnancy, and 120 of abdominal pregnancy.

32. Kussmaul: Von dem Mangel, der Verkümmerung und Verdopplung der Gebärmutter, Würzburg, 1859.

33. Sänger: Ueber Schwangerschaft im rudimentären Nebenhorn bei Uterus duplex. Gesellsch. f. Geb. und Gyn. in Leipsic. Centr. f. Gyn., 1883, p. 324 and Arch. f. Gyn., Bd. xxiv., 332.

34. Bandl: Deutsche Chirurgie, Lief. 59, p. 53, 1886.

35. Turner: Edinb. Med. Journal, May, 1886, vol. xi., p. 971.

36. On the subject of lithopædion consult the following papers: Küchenmeister (Centr. f. Gyn., 1880, No. 21, and Arch. f. Gyn., 1881, Bd. xvii., p. 153) who embodies all the ancient and classical facts of the fœtus lapideus by Rousset, 1590. Sappey: Comptes Rendus de l'Acad. des Sciences, August 22d, 1887. Virchow: Gesammte Abhandl., 1856, p. 790. Gaches Sarraute: Étude Microscopique du Lithopédion. Thèse de Paris, 1884. Fales: Lithopædion; History of a Case with Notes on Eleven Others. Annals of Gyn., Boston, October, 1887.

37. Parry: Extra-uterine Pregnancy, London, 1876, p. 155. Chaye: Signes et Diagnostic de la Grossesse Extra-utérine. Thèse de Paris, 1882. This paper contains two important observations by Brouardel.

38. Maygrier: Terminaisons et Traitement de la Grossesse Extra-utérine. Thèse d'Agrégation, Paris, 1886, p. 15. The author reports an important observation by Pinard as an instance of this mode of termination.

39. Chevalier: Arch. de Tocol., 1882, p. 73.

40. Jacquemier (Manuel des Accouchements, 1846, vol. i., p. 383) maintains that there is a cachexia to which certain women succumb long after the death of the fœtus, while the autopsy reveals no inflammatory lesions; in such cases there is evidently some putrid intoxication by the altered fluids in the fœtal sac. Zweifel (Obst. and Gyn. Soc. of Leipsic, Feb. 18th, 1889; Centr. f. Gyn., 1889, No. 31) has demonstrated the presence of enormous numbers of germs in all the fluids of a fœtus which, though dead for some time, was delivered at term (ectopic abdominal pregnancy). The patient, who was evidently septicæmic at the time the laparatomy was performed, recovered.

41. Oettinger: Bull. Soc. Anat., 1883, p. 286.

42. Atkinson (Med. Record, 1881, vol. xix., p. 49) reports an instance where the elimination occurred after eight years; Laupus (Inaug. Dissert., Göttingen, 1876), after twenty-seven years; Benicke (Berl. klin. Woch., 1875, p. 434), after twenty-eight years; Metcalfe (Med. Times and Gaz., 1872, vol. i., p. 655), after forty-three years; the woman was sixty-eight years old when she commenced to expel pieces of bone per rectum.

43. Machka (Wien. med. Woch., 1885, No. 82) reports the following curious observation. At a judicial autopsy performed in a case of sudden death (which in Austria necessitates medico-legal intervention) an interstitial pregnancy was found, together with rupture of the uterus. The body of the fœtus had escaped through this laceration and thence into the uterus from which it was extracted, while the head had remained in the fœtal sac.

44. Parry (loc. cit. [37]) observed this elimination 40 times among 248 cases of ectopic pregnancy which had gone beyond term, 10 of these cases being fatal; but nearly all occurred before the introduction of antisepsis. Deschamps (Sur les Divers Modes de Terminaison des Grossesses Extra-utérines, Thèse de Paris, 1880, p. 19) reports 5 cases, all followed by recovery. This should be the rule nowadays.

45. Total expulsion was observed by Pigeolet (Bull. de l'Acad. Méd. de Belgique, 1879, vol. xv., No. 1), Burkhardt (Berl. med. Woch., 1881, p. 698), and others. But the most frequent mode of elimination is piecemeal and may last months or even years. Späth (Wurtemb. med. Corresp.-Blatt, 1883, Bd. viii.) cites a case in which it continued for more than twenty years; it may entail septicæmia unless counteracted by the efforts of the physician. Parry notes its occurrence 65 times among 248 pregnancies which had gone beyond term. The gravity of this termination has been much exaggerated by Parry (34 per cent) and Deschamps (43 per cent). Maygrier, among 18 cases published between 1876 and 1886, found only one death.

46. Priestley (Obstet. Trans., 1880, vol. xxi., p. 24) observed its occurrence at the end of twelve years. Purefoy (Dublin Journ. of Med. Science, April, 1877)

records a case in which the suppuration lasted for more than a year before it terminated in recovery. Parry notes this termination in only five per cent. The prognosis is doubtful, in view of the few known instances. The simultaneous opening of the sac into the vagina and intestine gives rise to a complex fistula—intestino-cysto-vaginal; L. H. Petit (Annales de Gyn., Dec., 1882, Jan. to July, 1883) describes these conditions in his paper on ileo-vaginal anus.

47. Schultze: Jen. Zeitschr., 1864, Bd. i., p. 381. Hayem and Giraudeau: Arch. de Tocol., 1882, p. 481. Monnier: Progrès Médical, 1884, p. 1,010. Winckel: Samml. klin. Vort., N. F., 1890, No. 3.

48. Leopold: Arch. f. Gyn., 1876, Bd. x., p. 248, and 1884, Bd. xix., p. 210.

49. Olshausen: Third Congress of Germ. Gyn. Centr. f. Gyn., 1889, No. 30.

50. A curious instance of the difficulties of the diagnosis is reported by H. C. Coe (New York Obst. Soc., Oct., 1889; Amer. Journ. of Obst., Jan., 1890, p. 94). A woman who presented the signs of pregnancy complained of such pains as to lead to the belief that the pregnancy was ectopic. Laparatomy, which was followed by abortion, showed that the pregnancy, advanced to third month, was perfectly normal, and subsequent verbal examination eventually proved that the more or less hysterical patient had greatly exaggerated her sensations. One fact is worthy of note, namely, that the patient had previously submitted to electrical treatment which was so energetic as to cause a large eschar on the abdomen without killing the fœtus. The patient recovered.

51. This diagnostic mistake has probably been made in the majority of cases of tubal fœtal cyst extirpated before the fourth month. It is often more or less plainly evident in the recorded cases. See, for example, Tuttle: loc. cit. (7); Hanks: New York Obst. Soc., Amer. Journ. of Obstet., Jan., 1890, p. 92; Bouilly: Bull. Soc. de Chir., Dec. 4th, 1889.

52. Tarnier and Budin: Traité de l'Art des Accouchements, 1886, vol. ii., pp. 232, 239, 240, and 540.

53. Maas (Beiträge zur Tubenschwangerschaft, Inaug. Dissert., Berlin, 1887) cites a case in which death occurred in the course of an exploration.

54. E. Fränkel: Breslauer ärztl. Zeitschr., 1882, No. 7.

55. Mundé (Pregnancy in the Rudimentary Horn, etc., Amer. Journ. of Obst., Jan., 1890, p. 25) reports a case in which he performed laparatomy for a supposed tubal pregnancy, and again closed the abdomen when he had with great difficulty discovered his mistake; subsequent abortion; recovery. Similar errors of diagnosis have been committed, and recognized after laparatomy, by McDonald (Obst. Transac., Edinburgh, 1884–85, p. 76) who thought he had to deal with a fibroid; Sclifossowski, J. E. Janvrin, H. O. Marcy, Vander Veer (Concealed Pregnancy, in Amer. Journ. Obst., November, 1889, vol. xxii., p. 1,145).

56. Meadows: Obstet. Trans., 1873, vol. xiii., p. 271 and vol. xiv., p. 309. Scott has performed the operation during the false labor.

57. Brühl (Archiv f. Gyn., 1887, Band xxx., Heft 1), in a case of this kind, performed laparatomy three years after the death of the fœtus, on account of symptoms of suppuration of the sac. He thereby demonstrated the impossibility of extracting it through the abdominal incision, and the feasibility of opening and evacuating it through the vagina—an operation which resulted in recovery, although the bladder was wounded.

58. Tarnier and Budin: Traité de l'Art des Accouchements, 1886, vol. ii., p. 554.

59. Himmelfarb, of Odessa (Journal russe d'Obstétrique et de Gyn., 1884, No. 4, abst. in Münch. med. Woch., 1888, No. 35) has collated 36 cases, 24 of which died by rupture of the sac, 3 terminated in the formation of lithopædia, and in 7 laparatomy was done after the death of the fœtus (only one of which was full term), with 6 successes and one death.

60. Ritgen, cited by Keller: Des Grossesses Extra-utérines, etc. Thèse de Paris, 1872.

61. R. Barnes: Diseases of Women, 1874, p. 373.

62. Janvrin: Amer. Journ. of Obst., Nov., 1874, p. 432.

63. Keller: Loc. cit. (60), p. 54.

64. Simpson: Edinburgh Med. Journ., 1864, vol. i., p. 865. Braxton Hicks: Obst. Trans., 1866, vol. vii., p. 95. Freund: Arch. f. Gyn., 1883, Bd. xxii., p. 113.

65. Joulin (Thèse d'Agrég., 1863, and Traité Complet d'Accouch., 1866, p. 967) first proposed to kill the fœtus by injecting atropine or strychnine into the sac through a capillary puncture. Friedrich (Virchow's Arch., 1864, Bd. xxix., p. 312) was the first to execute this proposed procedure. Kœberlé (cited by Keller, loc. cit. [60], p. 57) likewise employed this measure with success. Tarnier, in endeavoring thus to kill a six-months' fœtus, set up a peritonitis to which the patient succumbed (Fourrier: Bull. Gén. de Thérap., 1874). Maygrier (loc. cit. [38]) collated six similar cases in 1886.

66. Gossmann (Münchner med. Woch., 1888, No. 50) reports a successful case, two injections having been given at an interval of two weeks. Winckel (Congress of German Gyn., Freiburg, 1889; Centr. f. Gyn., 1889, No. 29) cured a patient by two injections given at an interval of one week; another patient, by a single injection. He knew of nine cases in which this measure was said to have succeeded. Veit (ibid., No. 30) sanctions the procedure.

67. L. Meyer: Hospitals Tidende, Copenhagen, 1888, No. 30, and Zur operat. Behandlung der Extrauterinschwang. in Zeitschr. f. Geb. und Gyn., Bd. xv., Heft 1, 1888. A case of death after the injection of morphine is reported by Duncan: St. Barthol. Hosp. Rep., 1883, vol. xix., pp. 27–44.

68. Bachetti, of Pisa (Gaz. med. Ital. feder. Toscana, 1853, vol. iii., p. 137), at the instigation of Burci, was the first to employ electricity by electro-puncture. The patient recovered, but the diagnosis is doubtful.

69. Garrigues (Trans. Amer. Gyn. Soc., Philadelphia, 1883, v., p. 184) reports eight cases of cure which seem incontestable to him. A very large number have since then been published in American journals. A. Brothers (The Treatment of Extra-uterine Pregnancy by Electricity, in Amer. Journ. of Obstet., 1888, vol. xxi., p. 474) has collated 43 cases, mostly American, in which ectopic gestation was more or less positively diagnosticated and the same treatment employed; among these, 2 deaths and 4 grave accidents occurred.

70. Before the Obstetrical and Gynæcological Society of Moscow several cases of cure have been reported: one by Kalabine, one by Warneck, two by Netzwetrky (abstr. in Annales de Gyn., January, 1890).

71. G. M. Tuttle (Four Cases of Extra-uterine Pregnancy, in Amer. Journ. of Obstet., January, 1890, vol. xxiii., p. 13) makes this remark with reference to the unreliability of the statistics presented in America in favor of electricity.

72. Janvrin: Amer. Gyn. Soc., Sept., 1888 (abstr. in Annales de Gynéc., Jan., 1889, p. 59). The patient died after three days' electrization.

73. Veit (Zeitschr. f. Geb. und Gyn., 1885, Bd. xi., p. 384) was, it seems, the first operator who successfully practised early laparatomy (third month) for an extra-uterine pregnancy and extirpated the tubal fœtal sac. Since then, cases of this nature have become exceedingly numerous.

74. L. Tait: Lancet, Sept., 1888, p. 409.

75. Doléris: Répert. Univ. d'Obst. et de Gyn., 1889, p. 409. Czempin: Obstet. and Gyn. Soc. of Berlin, Oct. 25th, 1889. Centr. f. Gyn., 1889, p. 820.

76. Czempin: Ibid., June 28th, 1889. Centr. f. Gyn., 1889, No. 31. It was an intra-ligamentous pregnancy of four months, with general adhesions to the cæcum and the small intestine.

77. Veit: Verhandlungen der dritten deutschen Gesell. f. Gyn. in Freiburg, 1889. Arch. f. Gyn., Bd. xxxv., p. 512.

78. G. Thomas (Amer. Journ. of Obst., 1875): Pregnancy in the third month, serious hemorrhage due to injury of the placenta, septicæmic accidents, recovery. O'Hara (Amer. Journal of Obstet., 1878, p. 525): Pregnancy in the fourth month, hemorrhage, death of peritonitis on the third day.

79. Keller: Loc. cit. (60).

80. L. Tait: Brit. Med. Journ., 1884, i., p. 1,250; ii., p. 317; 1885, i., p. 778, and Lectures on Ectopic Pregnancy, Birmingham, 1888.

81. Schwarz (Verhandl. des zweiten Kongresses d. deutsch. Gesellsch. f. Gyn., 1889, p. 70) operated on a pulseless woman and found three quarts of blood in the peritoneal cavity; recovery. The accident occurred at the end of the second month. The first operation of this kind performed in Germany was by Frommel.

82. Litzmann: Arch. f. Gyn., 1880, Bd. xvi., p. 323. Werth: Beitr. zur Anat. und zur oper. Behandl. der Extrauterinschwang. Fraipont: Soc. Obst. et Gyn. de Bruxelles, October 20th, 1889 (abstract in Centr. f. Gynäk., 1889, No. 51). Harris: Amer. Journ. of Obstet., November, 1887, and Amer. Journ. of the Med. Sciences, August, 1888. Meyer: Zeitschr. f. Geb. und Gyn., Bd. xv., Heft 1.

83. Fränkel: Breslauer ärztl. Zeitschr., 1882, No. 7.

84. Maygrier: Terminaisons et Traitement de la Grossesse Extra-utérine. Thèse d'Agrég., Paris, 1886.

85. Werth: Loc. cit. (26), p. 142.

86. Normann: Norsk Magaz. f. Lægevidensk., 1880, Band x. Netzel: Hygiea, April, 1881.

87. Harris: Extra-uterine Pregnancy Treated by Cystectomy, etc. American Journ. Med. Sciences, August, September, 1888.

88. Lazarewicz, of Kharkoff: Wratsch, St. Petersburg, 1886, vii., 76–115 (abstr. in Répertoire Univ. d'Obstet. et de Gyn., July, 1886, p. 277). Total extirpation of the sac. The woman recovered, the child lived twenty-one days.

89. Breisky: Wien. med. Presse, 1887, No. 48. Operation in the eighth month of a tubal intra-ligamentous pregnancy. Complete extraction of the sac and placenta, rapid recovery of the mother. The child which was perfectly viable died three weeks later of phlebitis of the umbilical vein.

90. John Williams: Obst. Trans., London, 1887, p. 482. The sac was not extirpated but drained.

91. Eastman, of Indiana: Amer. Journ. of Obst., September, 1888, xxi., p. 929. An intra-ligamentous pregnancy of eight months, without rupture of the tube. Total extirpation of the sac, irrigation, drainage, recovery. The child was well formed and vigorous.

92. Olshausen: Gesellsch. f. Geb. und Gynäk. zu Berlin, November 9th, 1888. Centr. f. Gyn., 1888, No. 49, p. 811. Operation ten days before full term. Tubal pregnancy transformed into an abdominal pregnancy by rupture of the sac without hemorrhage six days previously. The child was free in the peritoneal cavity. Extirpation of the placenta and the remnants of the sac. Easy operation.

93. Braun von Fernwald: Obstet. and Gyn. Soc. of Vienna, March 26th, 1889. Centr. f. Gyn., 1889, No. 36. Abdominal pregnancy. The placenta was fixed in Douglas' pouch which was invested with a thick membrane, the only vestige of the sac, which also covered the posterior portion of the uterus and broad ligaments. Large vessels had to be tied; these extended from the ileac mesocolon to the placenta which was then detached. The hemorrhage necessitated elastic ligature of the uterus, hysterectomy, and tamponing of the peritoneum with iodoform gauze. Slow recovery of the mother. The child died twelve hours after operation of capillary bronchitis ascribed to inspiration of liquor amnii.

94. Treub: Zeitschrift f. Geb. und Gynäk., 1888, xv., Heft 2. Ovarian or tubo-ovarian pregnancy operated three weeks before term. Partial resection of the sac which was intimately adherent to the abdominal wall, extraction of the placenta, tamponing of the peritoneum with iodoform gauze. Uninterrupted recovery. Child living and thriving.

95. Lawson Tait: Amer. Journ. of Obstet., March, 1888.

96. Champneys: Brit. Med. Journ., December 3d, 1887.

97. Joseph Price: Communication to Harris: Amer. Journal Medical Sciences, September, 1888, p. 264.

98. Hildebrandt: Berliner klin. Woch., July 20th, 1885, p. 465.

99. G. Beisone: Gazetta Medica di Torino, 1881, xxxii., p. 553.

100. Trachet: Arch. de Tocol., November, 1888.

101. Among the foremost partisans of the primary operation I may mention particularly Keller, Kiwisch, Schröder, Fränkel, and Hofmeier.

102. Pinard: Dictionnaire Encycl. des Sciences Médic., art. Grossesse.

103. Kirkley: Amer. Journ. of Obst., February, 1885, p. 160. Death four hours after operation.

104. The following are the statistics on which the partisans of complete non-intervention or secondary operations base their arguments; all of them antedate the brilliant successes obtained in the last three years by the primary operation, and I only give the titles of the papers. Parry found that among 188 published cases which were left to nature 99 women had succumbed, or a mortality of 52.6 per cent; but, according to Hutchinson (Med. Times and Gazette, 1860, pp. 56–77, 105, 132; Lancet, 1883, ii., p. 71), of 73 cases of retention of the dead fœtus which were not interfered with, only 18 women died, thus reducing the mortality to 24.7 per cent. It is mainly these figures which induce Tarnier and Budin to incline toward the expectant plan.

Maygrier collated 70 secondary operations (after the death of the fœtus, second half of pregnancy); he found 25 deaths, or a mortality of 35.7 per cent. His statistics include some very ancient cases which would hardly count nowadays.

Werth (129), in a paper published a few months later than the preceding, gives a smaller list confined to operations performed between 1880 and 1886 and carefully verified. In 53 collected cases (40 without extirpation of the sac, 11 with extirpation, 2 with fruitless attempts at extirpation) he found a mortality of 37.7 per cent.

105. Gastrotomies performed in similar cases cannot be compared with transperitoneal laparatomies done for the purpose of evacuating or extirpating a fœtal sac lying free in the abdomen. These are the only cases in which the ancient surgeons could have been successful. The earliest case is that of Primrose, in 1594; then comes that of F. Plater (1597) and, a century later, that of Calvo (1714). As to laparatomy, properly so-called, Levret declared it to be too dangerous on account of the hemorrhage; Baudelocque, being more intrepid, advocated it and even pointed out the necessity of leaving the placenta untouched, the elimination of which should be left to nature. But it was McKnight (Mem. of the Med. Soc. of London, 1795, vol. iv., p. 342) who first performed it for a dead fœtus, and Heim (Rust. Mag. f. die ges. Heilkunde, 1813, Bd. iii.) for a living fœtus.

106. The following are the cases in which a rudimentary horn of a gravid uterus has been removed: Kœberlé (1866), Salin (1880), Werth and Litzmann (1881), Sänger (1882), Wiener (1885). One death in the case of Werth and Litzmann. In but one of these cases, that of Sänger, was the diagnosis made, in the others an extra-uterine pregnancy was believed to exist. Sänger: Centr. f. Gyn., 1883, p. 324. Wiener: Arch. f. Gyn., xxvi., p. 234.

MacDonald (Obst. Trans., Edinburgh, 1884–85, p. 76) has since then performed a Porro hysterectomy for a pregnancy developed in a rudimentary horn; the macerated fœtus weighed five pounds; the diagnosis was fibroid tumor. The patient recovered.

107. Certain conditions may necessitate special treatment. Hofmeier (Grundriss der gyn. Oper., 1888, p. 343), in a case of inflammation of the sac which was full of pus and gas, together with intense peritonitis, was induced to remove the whole of the uterus which formed a part of the septic focus. Two other cases of hysterectomy necessitated by strong adhesions have been published; the pedicle was left externally; death (Waitz, cited by Werner, loc. cit., p. 159). Turner: New York Med. Journ., Aug., 1886, abstr. in Centr. f. Gyn., 1886, No. 49.

108. Pinard: Annales de Gyn., April, 1889.

109. Werth (129) claims that the mixture of tannin and salicylic acid (Freund) prolongs the elimination of the placenta. For this reason he prefers benzoate of sodium.

110. Negri (Annales de Obstetr., March, 1885) reports a case in which he again completely closed the abdomen after cleaning the sac without extracting the placenta which could not be found. The patient made an uninterrupted recovery. Braithwaite (Obstetr. Trans., xxviii., p. 33, 1886) left the placenta in place because it adhered largely to the fundus uteri and neighboring structures; drainage; recovery without expulsion of the after-birth. These facts are curious and show the tolerance and absorptive power of these parts, but they should not form the basis for modifying our operative technique.

111. Martin: Berl. klin. Woch., December 19th, 1881, p. 217. To ensure hæmostasis during the extraction of the placenta, he also recommends to perforate its base in several directions with strong needles and to tie each segment separately before removal; this procedure is applicable only where the placenta is not inserted on the viscera.

112. It has been observed to persist for three years. Rousseau: Union méd. du Nord-Est, September, 1877.

113. Litzmann: Arch. f. Gyn., 1882, xix., Heft 1, p. 96.

114. Werth: Verhandl. der Versamml. der deutsch. Gesell. f. Gyn. in Freiburg, 1889. Arch. f. Gyn., xxv., p. 513.

115. Hofmeier, cited by Falk: Tubo-Ovarial Schwangerschaft, Inaug. Dissert., Berlin, 1887.

116. Kusnetzky, Sutugin, Muratow, Sajaïsky, Kadjan, Slavjansky, cited by the latter: Obst. and Gyn. Soc. of St. Petersburg, February 23d, 1889, abstr. in Centr. f. Gyn., 1889, p. 834. The cases of Kusnetzky and Sutugin are also mentioned in connection with Lazarewicz's case by Massalitinoff: Répert. univ. d' Obst. et de Gyn., 1886, pp. 277–78.

117. Quénu: Bull. de la Soc. de Chir., April 10th, 1889.

118. Wiedow: Verhandl. des dritten Kongresses der deutschen Ges. f. Gyn., Freiburg, 1889. Centr. f. Gyn., 1889, No. 29, p. 502.

119. Olshausen: Verhandl. des dritten Kongr., etc. Arch. f. Gyn., xxv., Heft 3, p. 515.

120. Baudelocque: L'Art des Accouchements, vol. ii., p. 483.

121. The first elytrotomy operation was performed in America by John King (Medical Repository, New York, 1813, p. 338, indication given by Parry, loc. cit., p. 258) for a living child at term which was saved, together with the mother. This case is doubtful. Caignon (Lancette Française, 1889, p. 155) publishes the case of a fœtus developed in the pavilion of the left tube; "peculiar" operation (elytrotomy). The six-and-a-half-months-old fœtus was extracted alive. Two years previously, Norman (Med.-Chir. Trans., London, 1827, vol. xiii., p. 348) published a case of elytrotomy for a dead fœtus.

122. The only incontestable case of elytrotomy with extraction of a viable child is that of Mathieson (Obst. Trans., 1885, vol. xxvi., p. 132), communicated by MacCallum.

123. Pinard: Documents pour servir à l'Histoire de la Grossesse Extra-utérine. Annales de Gyn., April, 1889, vol. xxxi., p. 246.

124. One may be exceptionally forced to use the forceps to extract a very firmly engaged head. Olshausen: Verhandl. der deutsch. Gesell. f. Gyn. in Freiburg, 1889. Arch. f. Gyn., Bd. xxxv., Heft 3, p. 516.

125. Dorff (Soc. Belge de Gyn. et d'Obst., October 20th, 1889, abstr. in Annales de Gyn., January, 1890, p. 60) saw one of Kaltenbach's patients succumb on the ninth day, in consequence of the difficulties of vaginal antisepsis. Barzony (Cent. f. Gyn., 1889, No. 22) likewise had a fatal case. Pinard (loc. cit.) has reported one good success.

126. Pinard and Varnier: Annales de Gyn., December, 1885, and January, 1889.

127. F. Winckel: Ueber den Durchbruch extrauteriner Fruchtsäcke in die Blase. Sammlung klin. Vortr., Neue Folge, 1890, No. 3.

128. P. Müller: Arch. f. Gyn., 1887, Bd. xxx., pp. 78–81.

129. Werth: Beiträge zur Anat. der Extrauterinschw., 1877, p. 126, case v.

130. Littlewood: Lancet, April 3d, 1886, p. 637.

131. Amer. Journ. of Obstet., Nov., 1891.

CHAPTER XIII.

DISEASES OF THE VAGINA.

VAGINITIS.

Pathogenesis—Etiology.—The mucous membrane of the vagina, like other mucous membranes in immediate contact with the air, is a dermo-papillary surface markedly analogous to the external integument in its rugosities and its stratified pavement epithelium. It is, however, distinguished from the skin by the absence of the impermeable corneous layer. The constant exfoliation of the cells of the mucous membrane and the incessant renewal of its exposed surface form its only protection against the action of external irritants, and it is difficult to understand exactly how the mucosa resists the action of the numberless germs which multiply in the vaginal canal. The new pathogenic theories in regard to the comparative receptivity of the various tissues to infection are evidently applicable to this case.[1] The vagina is the normal habitat of indifferent microbes. Several of these are pathogenic in character, but rendered inoffensive through attenuation (Winter). These morbid germs gain entrance in a number of ways—through the simple entrance of air, coitus, injections, etc. Inoculation shows that for these germs to multiply or to exhibit their virulence we require a medium favorable for their culture. Irritation is not, as held by the older authors, a sufficient cause. Burning with the red-hot iron and the action of caustics will cause but a localized lesion, an ulcer without surrounding inflammation, if injections be employed which prevent the accumulation of secretions; while the same lesion, or the presence of a foreign body otherwise aseptic, such as a pessary, will develop an intense vaginitis if with neglect of cleanliness we have the conditions which favor the development of the microbes. These considerations indicate the pathogenesis of vaginitis, and explain the predisposing influences of menstruation and parturition, as these favor the stagnation and decomposition of secretions.

Gonorrhœal infection is of supreme importance in the etiology of vaginitis, on account of the persistent character of the inflammation

caused, and the gravity of its complications. Since the discovery of Neisser,[2] the germ of this affection has been considered a specific coccus called the gonococcus, present in the form of rounded or oval bodies, resembling coffee beans, and sometimes adhering by their plane surfaces, producing a profile like the figure 8. In groups of five to ten, these form globular colonies surrounded by a single hyaline membrane. Associated with pus or more rarely with epithelial cells, they penetrate these and multiply in their interior. This property appears to distinguish them from other varieties of the same

FIG. 67.—MICROBES OF GONORRHŒA. (Neisser's gonococcus.) *A*, Transverse section of palpebral conjunctiva in a case of gonorrhœal ophthalmia which had been in existence for three days. The gonococci have penetrated the epithelial layer, and are scattered in small groups through the subepithelial tissue; *B*, specimen taken from the vaginal secretion of a puerperal woman; *a*, epithelial cell, and pus corpuscle, upon and around which may be seen bacilli and gonococci; *b*, gonococcus from a pure culture; *c*, diagram of the diplococcus of gonorrhœa (gonococcus) (Bumm).

form. This last assertion has, however, been contradicted by Stekhoven.[3] The gonococci penetrate the epithelium with greater ease where the cells have been disassociated by the formation of pus. The microbes are colored by methyl violet and fuchsin.[4]

Bumm states that the development of gonorrhœa is never primary in the vagina, but that invasion is by way of the cervix or more rarely the urethra, where the epithelium is least resistant. This is especially true of the cervix, where the epithelium is cylindrical.[5] According to Steinschneider[6] and Fabay,[7] however, the urethra is the more frequently attacked.

The rôle of the gonococcus was long undisputed, the facts proving its preponderating agency appearing to be easily demonstrated. Most numerous in the acute stage, rarer in the chronic forms, they multiply or diminish in number according as the disease is active or latent. They are found in gonorrhœal discharges from the urethra, the glands of Bartholini, the rectum, in gonorrhœal salpingitis, and in purulent ophthalmia. They have even been discovered in the blood and in the articular synovial fluid of patients suffering from gonorrhœal rheumatism.

Succeeding to this period of certainty has come a time of doubt and criticism. The specific value of the gonococcus has been denied on account of its extreme resemblance to the non-pathogenic diplococci. These microbes or pseudo-gonococci, so to speak, are found in intestinal, pulmonary, and buccal ulcerations, according to Eklund; according to Amicis, in simple experimental urethritis; and according to Steinberg, in urine, which he considers their normal habitat (Micrococcus ureæ). Is, then, the gonococcus but an indifferent saprophyte capable of taking on pathogenic characters under peculiar conditions; or is it a distinct species, having definite pathogenic properties and susceptible of attenuation and of preserving in a latent state the noxious properties to which it reverts in a favorable medium? This is the hypothesis which appears most probable; but, on the other hand, direct experiment by means of cultures and inoculations have not given a decisive result. Sometimes they produce gonorrhœa, but more often not.[8] Besides the presence of the microbe itself, there are other necessary factors which can be inferred but have not yet been demonstrated.

The pathogenic microbes of suppuration and putrefaction also cause vaginitis if favorable circumstances are present; that is to say, if they gain access to the genital canal in sufficient numbers, and if they find there in retained secretions a suitable medium for growth. These germs may be introduced from without. A gaping vulva enfeebled by rupture of the perineum favors their development. An opposite condition, the presence of a hymen at the introitus may have an analogous effect by a different mechanism, namely, the retention of secretions and of the menstrual discharge in the retro-hymeneal cul-de-sac. This is the predisposing cause of non-specific vaginitis in little girls and virgins; to it may be added masturbation, which causes direct inoculation. The various kinds of vulvar inflammation due to the erythemata and the exanthemata may also serve as the determin-

ing cause. Oxyurides, transported from the rectum, are often intermediary agents. Infection may be also by means of fistulæ communicating with the bladder or rectum. This is, however, exceptional. A frequent and often unrecognized medium is some pathological secretion from the uterus. The vaginal leucorrhœa which complicates metritis has no other known origin, as it disappears as a rule after curetting or efficacious medicinal applications. Local irritation and hyperæmia are not sufficient to produce vaginitis. They but permit the more rapid development of the original germ or of one introduced from without. This is the explanation of the influence of masturbation with or without the introduction of a foreign body, of the prolonged retention of a pessary with absence of care in regard to cleanliness, and of stasis due to disease of the heart or liver or to the presence of abdominal tumors or pregnancy. Bumm has made the curious statement that the latter condition will provoke an excessive development of gonococci even in cases where the date of infection has been very remote. The congestion of the genital organs at the period of the menopause, perhaps, determines the vaginitis of this period. To these agencies may be added: exposure to cold, excessive coitus, genital excitation, the use of the sewing-machine, horseback-riding, etc.

From a clinical point of view we distinguish a certain number of types:

1. The gonorrhœal vaginitis of adults, which is the most common form, and which is found also in little girls and virgins, in which case its nature is often unrecognized.[9]

2. The gonorrhœal vaginitis of little girls and virgins, which may be the result of gonorrhœal infection of unknown origin. In regard to this affection it may be said that ordinarily the vagina has been previously made receptive by an exanthem, such as measles or scarlet fever, which has enfeebled the whole system and caused a desquamation of the epithelium.[10] But there exists also a non-specific vaginitis due to the development of a simple saprophyte in feeble children or to a neglect of the laws of hygiene. I have indicated the rôle of the oxyurides, also that of narrowness of the hymeneal orifice, the predisposing influence of which can be compared to that of congenital phimosis in the production of balanitis in the male.

3. The vaginitis of pregnant women. This is sometimes due to an old gonorrhœa, but may be also be of non-specific origin, and still may cause marked symptoms, vegetations, discharges, etc. It is with-

out doubt due to infection by means of the staphylococcus or the streptococcus. As to the septic vaginitis of the parturient woman, it is not a distinct morbid entity, but simply a local manifestation to be ascribed, like other symptoms, to general suppurative tendency; often it is of mixed puerpero-gonorrhœal origin.

4. The vaginitis of the menopause and of old women has usually an undefined anatomical form. The absence of hygienic care and a herpetic diathesis are ordinarily sufficient to explain its production.

Pathological Anatomy.—The vagina is rarely affected through its whole extent; and then usually in the acute stage of an inflammation caused by a recent gonorrhœa, an exanthem, or an active local irritation such as a caustic injection or traumatism. In such cases the mucous membrane is swollen, reddened, and covered with muco-pus. Most frequently the general inflammation is preceded by inflamed

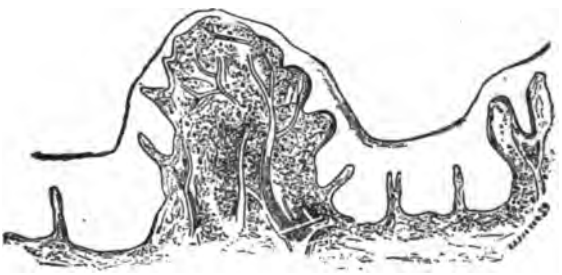

FIG. 68.—GRANULAR VAGINITIS (RUGE).

isles or plaques. In some cases diseased zones alternate with zones of healthy tissue.

From the standpoint of pathological anatomy, C. Ruge[11] distinguishes three forms of vaginitis: 1, granular vaginitis; 2, simple vaginitis; 3, senile vaginitis. We may add a fourth, emphysematous vaginitis: a rare lesion, but one which constitutes a distinct variety.

1. *Granular Vaginitis.*—This is the most common variety of vaginitis; the acute and chronic form being equally frequent. The epithelium is thickened, especially in its deeper layers, which the reagents color strongly. The papillæ are hypertrophied, infiltrated with small cells, and by diminution of the intervening spaces so fused as to form little masses called granulations. The epithelial reflections may become thinned, and take on a granular appearance, which may cause them to be mistaken for granular tissue itself; in such case we are liable to the error of believing that there is a follicular formation, whereas in reality there is merely a transformation of the

papillæ and their epithelial covering, with increase of the capillary reticulum (Fig. 68).

2. *Simple Vaginitis.* In this variety the epithelial surface remains quite smooth, but is thickened in spots. At the thinnest portions the papillæ are swollen, and the subjacent tissue is infiltrated with small cells. This proliferation is, however, limited to the epithelial layers, thus differing from granular vaginitis (Fig. 69).

3. *Senile Vaginitis* (Colpitis Vetularum).—This affection is present in the form of larger or smaller patches, elevated above the surface of the mucous membrane, and fused together in some places. These patches have a variable structure. Sometimes they present the characteristics of ecchymoses only; in other cases the centre of the patch is softened, and the epithelial covering is thinned or destroyed so as to permit the formation of adhesions which tend to obliterate the vaginal canal. Miliary vaginitis or the vesicular vaginitis described

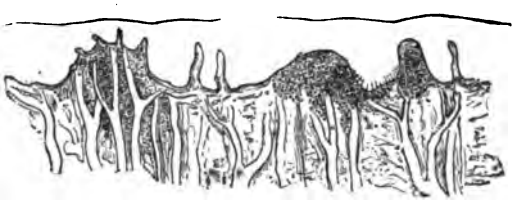

FIG. 69.—SIMPLE VAGINITIS (RUGE).

by Eppinger[12] belongs to this variety; also the ulcerating, adhesive vaginitis of Hildebrandt.[13] It is probable that it should include too the so-called leucoplasia[14] of the vaginal mucous membrane. All the reported cases of this affection have been in old women, and, according to the descriptions, the lesion is not different from that which has been described by Ruge. The reasoning which would prove them to resemble buccal psoriasis is superficial and faulty.

4. *Emphysematous Vaginitis or Cystic Pachy-Vaginitis.*—I have already referred to the inflammatory engorgement presented at times by the mucous membrane of the vagina during pregnancy. The rugæ separated by fissures have been compared by Winckel to grains of corn upon the ear. These elevations may be traversed by lacunæ containing fluid or gas. Except in pregnancy the affection is very rare. It has been called cystic colpo-hyperplasia by Winckel. The gas is not, however, contained in cystic cavities, but, according to Ruge, within the meshes of the connective tissue. The condition should, therefore, rather be called emphysematous vaginitis. Probably the formation of gas is secondary to a molecular degeneration of

inflammatory proliferating tissue, but this has yet to be demonstrated. Chiari holds that the gas is developed within the enlarged lymphatic capillaries, which are filled with swollen epithelial cells. The vesicles may rupture and form small temporary ulcerations, or they may desquamate in the form of scales.

Symptoms.—Where the vaginitis is the result of gonorrhœal infection or direct violence, local pain marks its invasion. Leucorrhœa is present, at first serous, then of a greenish-white color, puriform or frankly purulent in character. The discharge may be considerable in quantity, and give rise to a most annoying vulvar pruritus with subsequent enfeeblement of the general health. After the acute stage, the discharge becomes less, until finally the affection can be detected only by careful examination of the culs-de-sac, which form a kind of natural retreat where the remains of the old inflammation may for a long time linger. This fact has given rise to the designation, gonorrhœa of the culs-de-sac (Alph. Guérin, Martineau). The glands in the neighborhood of the meatus also remain for a long time infected. Gonorrhœal infection of the vulva and its glands is not alone enough to determine engorgement of the inguinal glands.[16]

In examination, Cusco's speculum is to be preferred. Digital examination reveals the condition of the mucous membrane—whether rugous or glandular; in the acute stage it is hot and painful.

Urethritis always complicates gonorrhœal vaginitis. To discover this condition, examine the woman shortly after the passage of urine. Follow the urethra with the finger from behind forward, so as to bring to the meatus the drop of pus which it contains.

The general health is often affected by an intense leucorrhœa; it produces in particular distressing gastric derangements and a febrile condition which may be either acute or subacute, due to salpingitis, with serous peri-salpingitis, the affection described by Nöggerath as recurrent parametritis.

Senile vaginitis often provokes no other symptom than a leucorrhœa, serous or tinged with blood (Schröder). Chronic vaginitis of this variety tends to destroy the tonicity of the vaginal wall and favor prolapse.

The symptoms of the emphysematous vaginitis of pregnancy may also be limited to the production of a discharge.

Vegetations, either benign or papillomatous, may be found on the vaginal mucous membrane which is irritated by prolonged contact with a muco-purulent secretion; they are frequent in gonorrhœal

vaginitis and are observed also in the non-specific vaginitis of pregnancy.

The discharge of pieces of the mucous membrane after astringent injections or simply under the influence of a very active inflammation has been called exfoliative vaginitis. This is a very rare phenomenon, and one which is not to be confused with the expulsion of an intrauterine or dysmenorrhœal membrane, the microscope here showing large pavement epithelial cells.

Diagnosis.—The great difficulty in diagnosis is the differentiation of gonorrhœal from non-specific vaginitis. The absence of the gonococcus is not sufficient, and counter-evidence for it may be lost or become unrecognizable in old gonorrhœal affections, as I have already indicated. An accompanying urethritis is proof of the gonorrhœal character of the disease. It is in the urethra, then, that we should look for the characteristic microbes. The course of the disease and the history of the patient will furnish important evidence. If, further, the woman can be confronted with the supposed author of the infection, as is often possible, the existence of even a very old or latent gonorrhœa in the man will amount to a demonstration. Gonorrhœal ophthalmia in one or several of her children will have the same diagnostic value. Pregnancy being excluded, the presence of vegetations is strong presumptive evidence. Coexisting inflammation of the glands of Bartholini is also a pretty certain index of gonorrhœal infection.

In little girls, especially in the case of a medico-legal examination, we should be careful not to pronounce too hastily upon the infectious nature of the affection, as the extension of a vulvitis due to a lack of cleanliness may involve the vagina, especially in a child of a lymphatic temperament; here too coincident urethritis has great diagnostic value.

The vaginitis of a pregnant woman may present conditions for analogous mistakes. It should not be forgotten that it is sufficient to account for vegetations. We should not confuse an inflammatory secretion with the fetid leucorrhœa of cancer or the discharge which succeeds retention of the membranes after abortion.

Prognosis.—Gonorrhœal vaginitis is a serious affection, on account of its possible extension to the cervix and subsequently to the uterus and tubes.[17] It is besides not very amenable to treatment, and tends to return under the influence of depressing agencies such as excessive coitus, chilling during menstruation, excessive fatigue, and the puer-

peral state. In its characteristics it greatly resembles an old gonorrhœa or *goutte militaire* in the male. Gonorrhœa is in the female incomparably more serious than in the male; this is easy to understand by comparing the prognosis of cervicitis with that of a chronic gonorrhœa of the bulbous portion of the urethra; or, again, the prognosis of a tubo-ovaritis, which is so liable to suppurate, with that of an epididymo-orchitis, which is very rarely a serious affection. More frequently than in the male, too, the ascending lesions are bilateral and cause sterility, obliteration of both tubes by chronic salpingitis being the rule in prostitutes.

The element of gravest prognosis in the gonorrhœa of the female is the fact that an apparently insignificant infection of the cervix may, under the influence of the puerperal state, regain all its first virulence, and, combining with septic infection, produce a mixed puerpero-gonorrhœal infection, and give rise to the gravest complications. The necessity for prompt and energetic treatment will be appreciated. The decision of Nöggerath [18] in regard to the incurability of this disease is not without exceptions if the patient is energetically treated in time.

The gravity of gonorrhœa in little girls is, as in the adult, dependent upon extension to the uterus, the tubes, and the peritoneum. Säxinger has observed pyo-salpingitis in virgins, where it could only be explained by the contact of some infected material, and not by coitus. I have myself recently operated upon a case of this kind. A case of generalized peritonitis reported by Welander concerns a little girl of five years; I have observed a case in a young girl. These cases are very rare, but death by suppurative pelvic peritonitis following pyosalpinx may, at least at times, be a result of gonorrhœal infection.

The other varieties of vaginitis are less serious and yield more readily to treatment.

Treatment.—We should first endeavor to discover what has provoked or keeps up the chronic inflammation; whether a pessary, the oxyuris, or cervical catarrh. In a large number of cases vaginitis is cured by treatment directed to a metritis upon which it depends. Thus Schröder's operation, or excision of the cervical mucous membrane, is one of the best methods of treatment for certain forms of chronic vaginitis dependent upon gonorrhœal cervical infection.

Chronic granular vaginitis and senile vaginitis are best treated by tampons of absorbent cotton soaked in borated glycerin or the glycerole of tannin, or the application of nitrate of silver in solution (1:20).

In the acute stage of gonorrhœal vaginitis, emollients are to be recommended. It is certain that prolonged baths and diluent drinks favorably affect the urethritis which accompanies the vaginal inflammation. Injections of marshmallow or of flaxseed tea, etc., are, on the contrary, of doubtful value, and may even do harm if not aseptic. Irrigations with several quarts of boiled water (4 to 6) containing a little corrosive sublimate (1:10,000) are to be preferred. A small glass nozzle should be carefully inserted, on account of the great sensibility of the vaginal mucous membrane. It is very important to keep the nozzle after each irrigation in a solution of carbolic acid (1:20). This will avoid any fresh inoculation to which the patient might be exposed without this precaution. The patient should be kept at rest.

The acute stage having been passed, energetic antiseptic treatment should be instituted; sublimate douches (1:2,000) should be given twice daily, taking care to erase the folds of the mucous membrane, and wash out the culs-de-sac with the finger. After each injection, place a tampon of iodoform gauze the size of a pigeon's egg against the external os; this will soak up the secretions, and, while having an antiseptic influence, will also act as a means of drainage. We may, if necessary, substitute for the sublimate injections creolin, permanganate of potassium, carbolic acid, boracic acid, alum, tannin, resorcin, or chloral. Sublimate is, however, incomparably the most efficacious, and has never given me any bad results in these cases. Fritsch[19] praises the chloride of zinc, two drachms and a half to the quart. In pregnant women, sublimate injections must be used with great care, and the return flow aided by the speculum, on account of the ease with which mercury is absorbed.

Balsamic treatment may be addressed to the concomitant urethritis. Copaiba and cubebs are, however, badly borne by women, and, moreover, urethritis is much less persistent than in the male on account of the shortness, straightness, and width of the canal. Iodoform pencils introduced into the urethra and slightly crushed by pressure through the vagina are very effective in chronic urethritis. When the treatment of the vaginitis is sufficiently advanced, the secondary metritis should be attacked, and with its cure we may expect the disappearance of the last remnants of the vaginal inflammation.

General treatment should not be neglected. Iron and tonics should be given to chlorotic subjects. Scrofulous children should have appropriate treatment.

Foreign authors have described, under the title of croupous or diphtheritic vaginitis, the production of a false membrane due to superficial sloughing of the mucous membrane. This has, however, nothing in common with what we in France designate by the word diphtheria; it is, on the contrary, but a gangrene of the vagina, less correctly called gangrenous vaginitis, and is encountered in cases of intense septic infection of the vagina, in cases of cancer of the uterus and sloughing fibromata, or where pessaries have been indefinitely retained in the vagina without care in regard to cleanliness. It has been observed also in an intense gonorrhœa, in the puerperal state, in the course of acute infectious illnesses such as measles, small-pox, typhus fever. It is not a distinct morbid condition, but a septic accident engrafted upon an inflammatory vaginal lesion. It furnishes no special indications for treatment except the prevention of the adhesions and contractions which follow exfoliation of the slough. For this purpose antiseptic tampons should be kept in the vagina, so as to separate the surfaces.

Dissecting phlegmonous vaginitis[20] or suppurative inflammation of the cellular tissue of the vagina is a specially located rare variety of pelvic abscess; it has been observed in the course of grave febrile conditions. Its treatment consists in giving exit to the pus as soon as it can be localized.

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1. It is the same with the action of the pneumococcus in pneumonia, whose decisive part has been demonstrated by Fränkel, Friedlander, and Talamon. However, Netter has discovered that this parasite is almost normally present in the saliva, nasal mucus, etc., in persons who have never been ill of pneumonia. When some traumatism or chill places such a subject in a morbid receptive state, the pneumococcus migrates and forms colonies in the lungs within a few hours. F. Foveau : De la Vaginite et de son Traitement. Thèse de Paris, 1888, p. 21.

2. Neisser : Ueber eine Gonorrh. eigen. Mikrococcusform. Cent. f. med. Wissensch., 1879, No. 28. As Neisser's precursors who suspected but failed to demonstrate the existence of parasites in blennorrhagic pus, we may cite : Donné (1844), Jousseaume (1862), Hallier (1872), Salisbury (1873), Bouchard (1878). On this subject compare Du Castel : Blennorrhagie aigue, in l'Union Médicale, August 21st, 1888, p. 241.

3. Stekhoven : Der Neisser'sche Gonococcus. Deutsche med. Wochenschr., 1888, No. 35. He claims to have demonstrated the presence of micro-organisms in the interior of leucocytes, in many conditions which had nothing in common with blennorrhagia.

4. Bumm (Archiv f. Gyn., 1884, xxiii., p. 327 and Der Mikroorganismus der gonorrhoischen Schleimhauterkrankungen, Wiesbaden, 1885) gives the following procedure for their discovery ; it is very expeditious and requires no more than

three minutes. The secretion is spread in a thin layer on a slide, dried over a flame, placed for one-half to one minute in a concentrated aqueous solution of fuchsin, drained, again dried over a flame, and at once examined under a homogeneous immersion objective.

5. Eraud (Lion Médical, July 22d, 1888, and Province Médic., November 9th, 1888) has made some investigations which confirm this assertion. He examined the urethral, vaginal, and uterine secretions of two hundred blennorrhagic women. The gonococcus was very rarely found in the vagina, but abundantly in the cervix.

6. Steinschneider: Berliner klin. Wochenschr., 1887, No. 17. The following is the result of his examination of 57 public prostitutes: 1. In all cases of blennorrhagia the urethra is the organ which is most frequently affected (47 per cent); next stands the cervical mucosa, then the uterine mucosa and Bartholin's glands. 2. In all cases of recent vaginal gonorrhœa urethritis coexists, and in this latter gonococci are always found, no matter how scanty the urethral secretion. 3. Long after the gonococci have disappeared from the urethra they are still discoverable in the cervix or the corpus uteri, even though they do not manifest their presence by any morbid symptom. 4. The mucosa of the vulva and vagina is unfavorable to the colonization of the gonococci. Their existence in the vaginal secretions is due to a migration from neighboring parts. This immunity is probably dependent upon the thick investment of pavement epithelium, the acid secretion, and the presence of numerous living germs normally domiciled in the vagina, which overcome the gonococcus.

7. Fabry: Deutsche med. Wochenschr., 1888, No. 43.

8. Neisser, Leistikow, Krause, Löffler, Bouchard, Kreise, Burner, and Crivelli never succeeded in producing blennorrhagia by the inoculation of pure liquid cultures. Crivelli: Nature et Traitement de la Blennorrhagie. Thèse de Paris, 1886. On the other hand, Boskai, Filkenstein, C. Paul, and Bockhardt effected urethritis by such inoculation, and the last-named author even excited cystitis and multiple abscesses of the kidneys, in a moribund general paralytic. Du Castel, loc. cit. (2). H. Poney (Recherches sur les Microbes du Pus Blennorrhagique; Thèse de Paris, 1888) obtained only one positive result out of six inoculations.

9. Ollivier (Note sur la Contagion de la Vulvo-Vaginite des Petites Filles; Bull. de l'Acad. de Méd., 1888, No. 13) observed an epidemic in the Hôpital de l'Enfant Jésus, which ceased under antiseptic precautions directed against the contagion. It is very probable that he had to deal with blennorrhagic infection. V. Dusch (Ueber die infectiöse Kolpitis kleiner Mädchen; Deutsche med. Wochenschr., 1888, No. 41) observed numerous cases in the Heidelberg Hospital; in half of these cases he was able to demonstrate, by careful inquiry, that the contagion could be traced to the parents, the brothers, or the sisters; the "house epidemics" have no other cause. F. Späth (Münchener med. Wochenschrift, May 28th, 1889) found Neisser's gonococcus in 14 out of 21 cases of vaginitis in little girls. In none of the other 7 cases was urethritis present. He was able to satisfy himself that the contagion had been effected through the linen, clothing, etc., in families or hospitals. Pott, of Halle (Gynæcol. Congress at Halle, in Centr. f. Gyn., 1888, No. 26) observed in the last twelve years 86 cases of vulvo-vaginitis among 8,487 little girls he had examined, namely: under 5 years, 56 cases; from 5 to 10 years, 23 cases; from 10 to 15 years, 7 cases. This affection was blennorrhagic, for an examination made by Cseri and Israel demonstrated the gonococcus. He does not believe in the frequency of the inoculation by rape, but rather in the contamination by means of the bed-sheets, when parents and older brothers sleep with the children; this inoculation is effected as easily in little boys as in little girls. Prochownik (ibid.) found the gonococcus 17 times in 21 cases of blennorrhagia of little girls.

10. Dusch (loc. cit. [9]) expressly notes that among little girls those most ex-

posed to infection have been affected with scarlatina. F. Späth (loc. cit. [9]) makes a similar remark, which proves, therefore, that the affection is blennorrhagic, by the presence of the gonococcus in the concomitant urethritis.

11. C. Ruge: Zeitschr. f. Geb. und Gyn., 1879, Bd. iii., p. 132.

12. Eppinger: Zeitschr. f. Heilkunde, Bd. iii., p. 177.

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14. P. Reclus: Cancroïde développé sur des Plaques de Leucoplasie Vaginale. Gazette Hebd. de Méd., July 1st, 1887. Gabriel Bex: Leucoplasie et Cancroïde de la Muqueuse Vulvo-Vaginale. Thèse de Paris, 1887. Of the six cases reported in this thesis, the first and second are simple cancroids of the vulva; the third, fourth, and fifth are instances of cancroids coexisting with patches of vaginitis; the sixth is a typical case of senile vaginitis in a diabetic. All the women were beyond the menopause.

15. About vaginitis during pregnancy in general, and this form in particular, consult Winckel: Arch. f. Gyn., Bd. ii., p. 406. Schröder: Deutsches Arch. f. klin. Med., 1874, p. 518. Schmolling: Dissert. Inaug., Berlin, 1875. Naecke: Arch. f. Gyn., Bd. ix., p. 461. Chenevière: Ibid., Bd. xi., p. 351. Zweifel: Ibid., Bd. xii., p. 39. C. Ruge: Zeitschr. f. Geb. und Gyn., Bd. ii., p. 29. Eppinger: Zeitschr. f. Heilk. Hueckel: Virchow's Archiv, Bd. xciii., Heft 2. Chiari: Prager Zeitschr. f. Heilk., Bd. vi., p. 81.

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CHAPTER XIV.

TUMORS OF THE VAGINA.—CYSTS, FIBROUS TUMORS, POLYPI, PRIMARY CANCER.

CYSTS.—*Definition.*—Two very different affections are often described under the same name: 1st, a chronic stationary disease presenting vesicles of about the size of a millet-seed, generally distributed over the vaginal mucous membrane, interesting from an anatomical point of view, but without surgical importance; 2d, a well-defined cyst of the vaginal wall, a condition which occasions serious difficulty and which calls for active interference. These cysts are well defined, usually unilocular and of a size varying between that of a small nut and an egg, tending to increase in volume if not surgically treated. The two affections, essentially distinct in pathological anatomy, course, symptoms, and therapeutic indications, have sometimes been confounded. In reality the first is but the variety of chronic vaginitis called cystic colpo-hyperplasia by Winckel.[1] I have already described it under the name of emphysematous vaginitis[2] in the paragraph devoted to the vaginitis of pregnancy. The contents of the vesicles or lacunæ are either fluid or gaseous, containing trimethylamin. In the study of cysts of the vagina proper, I omit this cystic pachyvaginitis, as the origin is obscure, the symptomatology presents nothing of interest, and therapeutically it may be considered with chronic vaginitis.

Pathogenesis.—The most diverse theories have been advanced to account for cysts of the vagina. Huguier,[3] in a *mémoire* which was for a long time considered a classic, assigned to them a glandular origin, classifying them as superficial and deep, according to their situation in the two species of glands which he thought existed in the vaginal wall. Now, these glands do not exist, but they may be simulated by crypts or lacunæ which, by obliteration of their orifices, may play the same pathological rôle. Virchow,[4] Guérin,[5] and Preuschen[6] accepted the theory of glandular and pseudo-glandular cysts; Poupinel[7] admits its probability in a certain number of cases. Other

authorities, among whom are Eustache,[8] Tillaux,[9] and his pupil Thallinger,[10] are disposed to consider them as hygromata or accidental serous sacs. According to Courty, they are of frequent occurrence in prostitutes.

This hypothesis is analogous to that of W. Dorn [11] for certain cysts observed in women who have borne children, as he believes these represent a traumatic serous effusion, similar in character to the traumatic serous cysts in other regions described by Morel-Lavalle.

The theory which best accords with the established facts is that advanced by Veit.[12] This finds the origin of vaginal cysts in the remains of the Wolffian canal in species of animals where it is very prominent, called the canal of Gärtner. Certain cysts of the vagina have been attributed to the non-union of the ducts of Müller and to the existence of a lateral vaginal cavity closed at the base and due to an aborted bifidity. Such cavities are, however, allied to hæmato-colpos or pyo-colpos and erroneously, I believe, described as cysts. I shall return to them in connection with the question of diagnosis.

Can we have a large cyst as a result of lymphatic ectasia, as is perhaps the case in the gaseous lacunæ of pachyvaginitis? This theory, advanced by Klebs,[13] has been accepted for certain cases by a number of authors.

On reviewing the theories which have been advanced for so complex a clinical group as the cysts of the vagina, we shall see that none of them corresponds to any well-defined anatomical type. One only can be logically accepted. This is that of Wolffian origin, shown in the most pronounced cases by several cysts disposed in a row, or having an upward prolongation in the direction of the broad ligament. All the others are hypothetical in character and based only on remote analogies. I believe that all vaginal cysts larger than a walnut are of embryonal origin. It has been remarked that they occur singly or are few in number, and then disposed in a vertical series, as though resulting from the moniliform dilatation of a straight tube.

Where we have a large number of small cysts covering the whole or a limited part of the vaginal mucous membrane, whether irregularly distributed or disposed in groups, I consider them of pseudo-glandular formation by the obliteration of the openings of crypts or lacunæ, in the bottom of which epithelium accumulates, to give place later to a fluid exudation. It is easy to differentiate the two anatomical types.

Without absolutely denying other methods of origin, I believe

them to be excessively rare. I must not omit to mention that Porak [14] reports a case of hydatid cyst of the vagina.

Etiology.—Vaginal cysts are found at every age, and in virgins as well as in women who have borne children. We think the agency of excessive coitus as suggested by Courty to be very doubtful. Labor may have a certain determining influence, not in consequence of traumatism of the vagina, but by the over-nutritive activity of the whole generative tract caused by pregnancy, which has its proportional influence upon the abnormally persisting embryonal remains as well as upon the epithelium covering the folds and crypts of the vaginal mucous membrane.

Pathological Anatomy.—Cysts of the vagina are most frequently single. Several cysts were present in only 28 of the 122 cases collected

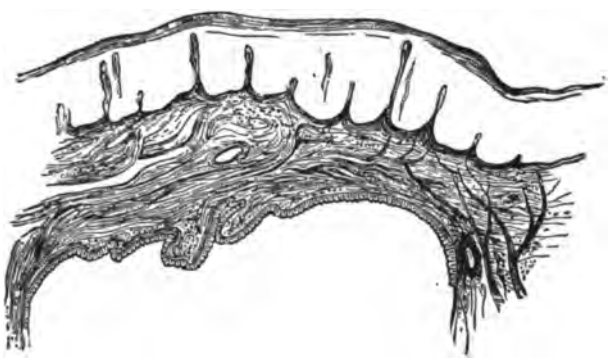

FIG. 70.—SECTION OF THE WALL OF A CYST OF THE VAGINA (SCHROEDER). The external surface shows the pavement epithelium of the vagina; the internal, the cylindrical epithelium of the cyst.

by Poupinel,[15] or 22%. The number very rarely exceeds three or four. Poupinel has reported one case in which fifteen were agglomerated into a single tumor, but he reasonably ascribes this to a pseudo-glandular formation. The cysts which develop from the Wolffian body are single, as a rule, rarely multiple, and then disposed one after the other in a row (Johnston).[16] Their size varies between that of a pea and a turkey's egg. Veit has seen one the size of the fœtal head. The most frequent location is the upper portion of the anterior or posterior vaginal wall. In one case, that of Bastelberger,[17] the hymen formed part of the wall of the cyst. Sometimes the cavity has a prolongation superiorly. In the case of Watts,[18] so frequently quoted, the sound when introduced into the cyst through an incision passed in the direction of the broad ligament. Boursier [19] has seen a case in which a solid pedicle was plainly to be demonstrated deeply located

and extending from the upper portion of the cyst. Reboul[20] has a similar case, but the pedicle was partly hollow. These evidently belong to the list of cases of Wolffian origin.

The wall of the cyst is composed of finely fibrillated connective tissue, sometimes containing muscular fibres. These, however, have not the pathognomonic significance sugggested by Poupinel, who thought they indicated the origin from the ducts of Gärtner. The vaginal mucous membrane usually covers the free surface, but it may be so thinned and degenerated as to be ultimately fused with the wall of the cyst, which then becomes translucent in character. An analogous degeneration has sometimes resulted in perforation into the bladder, as in a case reported by Veit.[21] As a usual thing, the internal surface of the cyst is covered by cylindrical epithelium (Ruge), but pavement epithelium has also been found (Meyer, Lebedeff, Ruge, Baumgarten,[22] etc.). The eccentric pressure resulting from distention of the cavity may produce a flattened or pseudo-pavement aspect in cylindrical epithelium (Max Graefe[23]). Ciliated epithelium has been found in a few cases—6 times out of 52 cases, according to Poupinel.

The internal wall with its epithelial covering was entirely absent in four of the published cases (Verneuil, Ladreit de la Charrière,[24] Lebedeff). It is these cases which seemed to lend some support to the theory of hygromata. But even if we suppose that the examination was made under the best of conditions, the destruction of the internal coat might be otherwise accounted for in many ways.

Sometimes we find prominent papillæ upon the internal surface (Kaltenbach,[25] M. Graefe). Kleinwächter[26] has demonstrated adenoid degeneration of the wall of the cyst.

The contents vary in consistency and color; most often they are viscid, transparent, and of a pale yellow tint, containing pus or altered blood.

Cheron[27] has described a cyst of the vagina which opened into the urethra and contained a calculus, it was probably a simple urethrocele. Breisky considers it not impossible that the cavity of an urethrocele by obliteration of its orifice may constitute a pseudo-cyst.

Symptoms.—In its early stages the cyst attracts no attention, the earliest sign indicating its presence being prolapse of the vaginal wall, which is dragged down by the constantly growing tumor, and which the patient believes to be a descent of the uterus. Examination for pregnancy or a gonorrhœa leads to the discovery of the condition. The tumor is rounded, smooth, sessile or with a tendency to pedicula-

tion; the mucous membrane which covers it often preserves its normal color; rarely it is thinned and transparent. Fluctuation is often difficult to obtain when the cyst is small and tense. It sometimes becomes evident by seizing the tumor between the two fingers or by combining the rectal with the vaginal touch. On effort, the tumor can be made to appear at the vulva, then resembing a cystocele if it occupies the inferior part of the vagina.

When the cyst has attained a certain size, it occasions a sensation of pressure and of discomfort on walking. Leucorrhœa will be provoked by the irritation of the mucous membrane, and its exposure to the air consequent upon the procidentia of the tumor. In a case which I observed, a large single cyst existed simultaneously with a vertical septum of the vagina, pointing apparently to its embryonal origin.

These cysts are rarely so large as to constitute an obstacle to urination or delivery; the latter might cause rupture of the cyst, which would, however, soon return.[28]

Diagnosis.—I have already distinguished between true cyst of the vagina and cystic vaginitis characterized by the presence of a multitude of very small cystic cavities in the substance or upon the surface of the thickened mucous membrane. I have referred to the fact that this affection is found in pregnancy as a rule, although not limited exclusively to that condition, and that the little cavities contain gas which sometimes escapes with a crackling noise when they are opened.

Large cysts of the vagina are as a rule single, and form a prominence upon the anterior or posterior wall of the canal after the manner of a cystocele, an urethrocele, or a rectocele, especially if situated in the inferior portion. Error is avoided by combining catheterization or rectal examination with the vaginal touch.

Vaginal cysts may be confounded with certain peri-urethral cysts of the vestibule, having their origin in the crypts which surround the meatus urinarius. These are rarely larger than a bean, although Preuschen has seen one the size of a walnut. It is not impossible that these cysts also have their origin in the terminal extremity of the canal of Gärtner.[29] Skene[30] believes them to arise from two peri-urethral glands, but the existence of these glands is not yet substantiated.

Cysts of the upper part of the vagina are often distinguished with difficulty from small tumors located in the cul-de-sac of Douglas,

prolapsed ovaries, cystic or non-cystic, inflammatory conditions of the tubes, and the collections of peri-salpingitis. Careful examination, under anæsthesia if necessary, will eliminate doubt in regard to these conditions.

A collection in an accessory vaginal cavity is sometimes regarded as a vaginal cyst. The cavity is due to bifidity of the organ, the result of incomplete fusion of Müller's ducts. When this bifidity, as is usually the case, extends to the vulva, there are two vaginæ, one of which is more or less atrophied, but in exceptional cases the second vagina terminates in a cul-de-sac, into which opens a second os uteri, due to coexisting bifidity of the uterus. The condition may be unsuspected until puberty, when the cavity, becoming filled with menstrual blood, gives rise to a lateral hæmato-colpos or, if the cavity suppurates, a lateral pyocolpos. As the bifidity of the cervix is rarely evident, there will be often no indication of the particular character of the vaginal collection, which is therefore mistaken for a cyst until it has been opened, when the discovery of a second os uteri clears the diagnosis. I observed a case of this kind in which the pseudo-cyst had suppurated and given rise to a fistula.[31]

Hydatid pelvic cysts[32] may project either through the vesico-vaginal septum or the recto-vaginal septum, and simulate vaginal cysts.

Treatment.—We can here apply any of the different operations which have been described for other submucous cysts, as, for example, in ranula. Simple puncture or incision alone is insufficient. Puncture followed by a caustic injection may provoke an extensive inflammation, which may be propagated to the bladder or the peritoneum; there may also be unlooked-for extensions or prolongations of the cystic cavity. The surgeon has to choose between complete and partial extirpation. The first may be preferable if the tumor can be easily reached, as, for instance, if it be located near the vulva. Yet, even so, its dissection is difficult on account of close adhesions with the deeper tissues, and of the neighborhood of the urethra and bladder. It may even become impossible if the cyst ruptures during the operation. To avoid these difficulties, in one case I advantageously resorted to the process for the removal of certain cystic tumors[33] which I described some time ago. After opening the tumor, I filled the cavity with white spermaceti wax, subsequently solidifying it by an application of ice. I then very easily dissected out the tumor. The wound is immediately united by a continuous catgut suture in layers.

Partial excision is preferable where the cyst is located in the upper third of the vagina, toward the posterior wall. The tumor is to be seized with a tenaculum, opened by the scissors, and a portion of the wall with the mucous membrane covering it excised. Schröder recommends suturing the lips of the opening to the vaginal mucous membrane in order to make the opening permanent. This precaution seems to me unnecessary. It is quite sufficient to tampon the interior of the cyst with iodoform gauze; the part of the wall which has not been removed subsequently exfoliates spontaneously.

FIBROUS TUMORS AND POLYPI.—*Pathological Anatomy.*—Fibrous tumors of the vagina may originate in the uterus, and by their gradual descent open out the recto-vaginal septum. Some tumors, however, have their origin in the vagina itself.

The structure[34] of these tumors is similar to that of uterine fibroids; they are composed of a mixture of connective tissue and unstriped muscular fibres. Paget[35] has described the only example on record of a tumor composed exclusively of fibrous tissue.

The most common location for fibrous tumors of the vagina is the superior portion of the anterior wall. They are often very adherent to the urethra[36] and descend to the vulva.[37] They are usually of small volume; one has, however, been reported which weighed over two pounds.[38] They may be pediculated and have a polypoid form, or may exhibit softening or œdema, as is the case with the fibrous tumors of the uterus, or may slough superficially and present ulcerations.

Etiology.—These tumors are most frequently found in middle age, although instances have been known in young children (Trätze, Wilson, A. Martin).[39]

Symptoms.—These depend altogether upon the size of the tumor. If very small, it is unnoticed or simply occasions leucorrhœa. If larger, hemorrhages[40] may be present, and the symptoms of compression, especially of the bladder. One case has been reported in which a fibrous tumor of the vagina was the cause of dystocia.

Diagnosis.—This is complicated by changes in the tumor, such as œdema and ulceration, which may cause it to resemble a cancer. A study of its relations enables one to differentiate a polypus of the vagina from a polypus of the uterus, a prolapsus, or an inversion.

Treatment.—This consists in the enucleation of sessile tumors, and section of the pedicle in a polypus. The procedure has been described in the chapter on the Treatment of Fibroid Tumors of the Uterus.

PRIMARY CANCER OF THE VAGINA.—*Pathological Anatomy.*—Most frequently cancer of the vagina is secondary to cancer of the cervix. It may also be produced by extension from cancer of the vulva. Primary cancer of the vagina is very rare. A. Martin has seen it but once among 5,000 patients. It may occur in one of three forms: 1st, papillary; 2d, infiltrated or nodular, both included histologically under the term epithelioma; 3d, sarcoma, either diffuse involving the whole of the mucous membrane, or circumscribed and arising from a degenerated fibroid tumor.

Etiology.—Cancer of the vagina is sometimes present in youth, but is most frequent during middle age. Of 24 cases collected by Kuestner[41] the majority were in women between thirty and forty years, 2 in women between fifteen and twenty years, and 2 in women between twenty and thirty years. Guersant has reported a case of cancer of the introitus in a child of three and one-half years; Johannowsky,[42] one in a child of nine years. Kuestner has noted the factor of heredity once only. Hegar has seen a cancer produced in the neighborhood of an ulceration due to the prolonged retention of a pessary. It is somewhat strange that cancer has never been observed in the prolapsed uterus which is exposed to all the influences of external irritation.

Epithelioma of the papillary form usually attacks the posterior wall of the vagina, making its appearance as a broad-based excrescence, which first invades the cul-de-sac, and then extends from above downward toward the vulva, and then from below upward toward the cervix. (See Plate VIII.) It appears to have its origin at times in the neighborhood of the plaques of chronic vaginitis, which have been somewhat theoretically compared to buccal leucoplasia, the point of departure for lingual cancroid.[43]

Epithelioma of the nodular or infiltrated form appears as nodules which rapidly become confluent. The growth is sometimes localized about the wall of the urethra, giving rise to a well-defined clinical type, peri-urethral cancer. Ulceration here advances rapidly.

Sarcoma presents two varieties: 1st, diffuse sarcoma of the mucous membrane, which is peculiar in that it sometimes is found in young children;[44] 2d, fibro-sarcomatous tumors, degenerating slowly and often revealed only by the recurrence of a fibroid tumor or a polypus. In one case striated muscular fibres were demonstrated.[45] Melanotic sarcomata have been observed.[46]

The course of cancer of the vagina is usually rapid, excepting in

the fibro-sarcomatous form, in which it may be excessively slow. Extension is to the lymphatics and to neighboring parts.

The rational signs do not differ from those of cancer of the cervix; they are: a fetid discharge, hemorrhage, pain, and symptoms of pressure upon the bladder and rectum. It is not necessary here to take into consideration the syphilitic chancre, as it is of rare occurrence,[47] nor the round simple ulcer,[48] which is a rare lesion and not well defined.

Treatment.—While there are but few chances of complete recovery, we may arrest somewhat the course of the disease. We shall only consider extirpation, if it be possible to remove the whole neoplasm;[49] in such a case, on account of the great laxity of the vaginal walls, we may obtain primary union of even an extended wound. Hegar and Kaltenbach recommend operation, even where the bladder and rectum are involved. Mundé[50] in one case opened Douglas' cul-de-sac, closing it with a catgut suture, and, after a slight attack of pelvic peritonitis, his patient recovered. In a case of cancer of the posterior wall, Rueter[51] sutured the raw surface of the wound to the previously freshened cervix. This plastic restoration of the parts prevented a recurrence, and at the end of three years pregnancy followed.

In the case of a woman where the cancer involved the whole of the recto-vaginal septum, sloughing had given rise to a cloaca. Eiselberg,[52] in this case, resected the coccyx, and established an artificial anus in the sacral region, after having extirpated the whole of the diseased part. The wound was then drawn together by sutures, and the uterus was brought down and fixed, so that the cervix opened externally in the neighborhood of the cutaneous margin. Recovery was rapid. Menstruation was free, and before long stools were retained. This bold operation is worthy of imitation.

In case extirpation is impossible, we may resort to curetting, followed by cauterization with the red-hot iron. Antisepsis of the vagina is to be maintained as far as possible by injections and tampons of iodoform gauze.

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16. Johnston: A Contribution to the Study of Cysts of the Vagina. American Journ. of Obstetrics, 1887, vol. xx., p. 1,144.

17. Bastelberger: Arch. f. Gyn., 1884, p. 427.

18. Watts: Cyst of Anterior Vaginal Wall Developed from Gärtner's Canal. Amer. Journal of Obstetrics, 1881, vol. xiv., p. 848.

19. Boursier, of Bordeaux: Leçons de Clinique Chirurgicale, p. 237.

20. Reboul: Annales de Gynécologie, 1889, p. 126.

21. Veit: Loc. cit. (12). The communicating orifice admitted the little finger; contents were dermoid, without hair or teeth, and a wall invested with pavement epithelium.

22. P. Baumgarten: Ueber Vaginalcysten. Archiv f. pathol. Anat., 1887, Bd. cviii., p. 528.

23. M. Graefe: Zehn Fälle von Vaginalcysten. Zeitschrift f. Geb. und Gyn., Bd. xxiv., p. 119.

24. Ladreit de la Charrière: Arch. Gén. de Méd., 1858, vol. i., p. 528.

25. Kaltenbach: Zusammengesetzte Cyste der Scheide. Archiv f. Gyn., 1873, Bd. v., p. 138.

26. L. Kleinwächter: Ein Beitrag zu den Vaginalcysten. Zeitschr. f. Geb. und Gyn., Bd. xv., Heft 1. A paper based on the study of nine unedited cases.

27. Chéron: Volumineux Calcul Développé dans un Kyste du Vagin ouvert dans l'Urèthre, chez une Femme de 67 ans. Gaz. des Hôp., April 30th, 1887.

28. Spontaneous rupture of a cyst has been observed during pregnancy. Magnin: Kyste du Vagin; Rupture spontanée au 7e mois d'une grossesse; pas d'accident. Journ. de Méd. et de Chir. prat., 1883, p. 184.

29. J. Koks: Ueber die Gärtner'schen Gänge beim Weibe. Arch. f. Gyn., 1882, Bd. xxi., p. 487. Kleinwächter: Ein Beitrag zur Anat. und Path. des Vestibulum

Vaginæ. Prag. med. Wochens., 1888, No. 9. This opinion has been combated by Dohrn: Ibid., Bd. xxi., p. 328. Compare the synopsis of these discussions in Winckel: Lehrbuch der Frauenk., 1886, p. 104.

30. Skene: The Anatomy and Pathology of Two Important Glands of the Female Urethra. Amer. Journ. of Med. Sciences, 1880.

31. This inflammation, however, was not due to the accumulated menses which did not seem to be furnished by the atrophied portion of the uterus corresponding to the small vagina ending in a blind pouch. The suppuration originated in a blennorrhagia of the main vagina, which was doubtlessly propagated into the accessory vagina by means of the cervix uteri whose closure would appear to have been incomplete.

32. Schatz: Beiträge mecklemb. Aerzte zur Lehre von der Echinococcenkrankheit, Stuttgart.

33. S. Pozzi: Procédé pour Favoriser la Dissection et l'Ablation de Certains Kystes à Contenu Liquide ou Demi-liquide. Bull, de la Soc. de Chir., 1878, p. 715.

34. Mucous polypi are described (Beigel, Klob) as the result of partial hyperplasia of the vaginal mucosa (Breisky: Die Krankheiten der Vagina, 1886, p. 162). Some of these structures, which are, moreover, very rare, seem to inclose considerably dilated lymphatics, which would justify their comparison with molluscum pendulum of the vulva and their designation as elephantiasis mollis, under which heading Meinert has described a specimen presented to the Gynæcological Society of Dresden, April 12th, 1888.

35. Paget: Lectures on Surg. Pathol., vol. ii., p. 115.

36. Tillaux: Fibro-myome de l'Urèthre. Annales de Gynéc., September, 1889. Manifestly, this was a case of fibroid of the vagina which adhered to the urethra. Griffith (Obst. Soc. of London, July 6th, 1889; Centr. f. Gyn., 1889, No. 50), in an identical case, observed a fibroma adherent to the urethra.

37. E. Fränkel: Orangengrosses breitbasiges Fibromyom der Vagina und Vulva; Enucleation; Heilung. Bresl. ärztl. Zeitschr., 1887, ix., p. 59.

38. R. Hastenpflug (Ueber Vaginal-Myome, Inaug. Dissert., Jena, 1888) reports a case from Schultze's clinic, in which a fibroid of the vagina attained extraordinary dimensions. Springing from the anterior vaginal wall to the left of the external os, the tumor completely filled the canal and extended in one direction as far as the vulva, in the other within a hand's breath of the umbilicus, by elevating the uterus; it was partly gangrenous.

Other instances of large fibromas will be found in the following papers: Lewers: Fibroid Tumor of the Vagina. Trans. Obstet. Soc. of London, vol. xxix., p. 299. Tchunichin: Journ. russe d'Obst. et de Gyn., vol. i., Nos. 7 and 8, abstract in Centr. f. Gyn., 1888, No. 7.

39. Trätzl: Monatschr. f. Geb., 1863, Bd. xxii., p. 227. Wilson: Med. Times and Gaz., April, 1876, p. 360. A. Martin: Zeitschr. f. Geb. und Gyn., 1878, Bd. iii., p. 406.

40. A. Donald: Fibroid Tumor of the Vagina Associated with Uterine Hemorrhage. Medical Chronicle, Manchester, 1888, p. 303.

41. Küstner: Arch. f. Gyn., Bd. ix., p. 279.

42. Cases cited by Winckel: Lehrbuch der Frauenkr., 1886, p. 174.

43. Reclus: Cancroïde et Leucoplasie des Muqueuses Buccale et Vaginale. Gaz. Hebd. de Méd., 1887, p. 420.

44. Numerous cases are now known of primary sarcoma of the vagina in children of from two to five years. They are reported by Sänger, Ahlfeld, Soltmann, Hauser, Babes, Graenischer, Schuchardt, Steinthal. On this subject see Graenischer: Dissert. Inaug., Munich, 1880. Schuchardt: Gyn. Congress at Halle. Centr. f. Gyn., 1888, p. 422. Steinthal: Ueber das primäre Scheidensarkom. Arch.

f. path. Anat., 1888, Bd. cxi., p. 449. Schuchardt: Ueber die papillaren Scheidencarcinome kleiner Kinder. Verhandl. der deutsch. Gesell. f. Gyn., Leipsic, 1888, p. 237.

45. Kaschewarowa-Ruduewa: Virchow's Archiv, 1872, Band liv., p. 65. Case from Seyfert's clinic in Prague relative to a young girl aged 15: relapsing polypus of the anterior wall; rapid death from cachexia and tuberculosis. The tumor was a myxomatous rhabdo-myoma.

46. Parona: Annal. Univ. di Med. et Chir., Milan, 1887, p. 241. It was a case of melano-sarcoma of the vesico-vaginal septum, extirpated with a portion of the bladder. Temporary recovery.

47. Prieur: De la Syphilis Vaginale Secondaire. Thèse de Paris, 1881.

48. W. Zahn (Virchow's Archiv, 1884, Bd. xcv., p. 388) describes under this name an ulcer with sharp perpendicular borders and red base which he found in the posterior vaginal cul-de-sac of a woman 66 years old. There was no induration; infiltration of the connective tissue with small cells and fatty degeneration of the muscular fibres; numerous micrococci. Atheromatous narrowing of the vaginal arteries, obliteration of one branch passing to the ulcerated region. Zahn compares this ulcer from ischæmia to certain gastric ulcers. An analogous case is reported by Browicz (Centr. f. Gyn., p. 414) under the name of "rodent ulcer of Clark." This also occurred in an old woman (59 years) with arterial sclerosis. These ulcers, therefore, seem to be the result of true infarctions and have been observed only under conditions where these occur—a fact which may be of service in making the diagnosis.

49. Brückner: Der primäre Scheidenkrebs und seine Behandlung. Zeitschr. f. Geb. und Gyn., 1881, Bd. vi., p. 110.

50. Mundé: Two Cases of Primary Epithelioma of the Vulva and Vagina. Amer. Journ. Obstet., 1889, xxii., p. 476.

51. Rüter, of Hamburg: Centr. f. Gyn., 1887, No. 38.

52. V. Eiselsberg: Obst. and Gyn. Soc. of Vienna, March 12th, 1889. Centr. f. Gyn., 1889, No. 35, p. 619.

CHAPTER XV.

CICATRICIAL FISTULÆ OF THE VAGINA.

THE vagina may communicate with the neighboring cavities by permanent cicatricial orifices or canals lined with new tissue covered with epithelium. These abnormal means of communication or fistulæ are of two classes: those which give passage to urine, and those which give passage to fecal matters.

URINARY FISTULÆ.—*Etiology.*—We exclude from the class of cicatricial fistulæ or fistulæ proper, the fistulous communications produced by cancer in an advanced stage of its development.

In the large majority of cases fistulæ date back to a difficult labor which has produced sloughing of a more or less extensive portion of the genital canal. If the fœtal head remains too long at the inferior strait, the vesico-vaginal septum is caught against the pubes, its vitality is compromised, and sloughing follows. This is the case where there is narrowness of the pelvis and exaggerated size of the fœtal head, or shoulder presentation; and it is the duration rather than the intensity of the pressure which determines the injury.

Other causes of fistula are of less frequent occurrence. The vesico-vaginal septum may be wounded by the forceps, the cephalotribe, or other instrument. Sometimes the surgeon produces the perforation intentionally as in vaginal incision for stone, or accidentally during hysterectomy.

Vesical calculi[1] give rise to fistulæ by ulceration in the neighborhood of the calculus where it is encysted, or by provoking abscess at a point of obstruction. Foreign bodies in the bladder act as the exciting cause only by serving as the nucleus for a calculus.[2]

Ulcerations of the bladder[3] secondary to chronic catarrh have very exceptionally advanced to perforation of the septum.

Tuberculous ulcerations of the vagina are a pathological rarity, and, if they produce a perforation, this abnormal orifice does not cicatrize; hence they have no more place in the classification of fistulæ than have the perforations of cancerous origin.

Pathological Anatomy.—The location varies with the relations of the bladder and urethra to the superior border of the pubes at the time of labor, as the fistula is produced by pressure against this bony prominence. The walls of the uterus itself are never the seat of perforation from this cause, as the internal os always maintains a position above the pubic bone. This is not true, however, of the anterior wall of the cervix, and this is sometimes, although rarely, perforated. There then results a fistula between the cervix and bladder called the vesico-uterine, or, to be more exact, the vesico-cervical fistula. Ordinarily the external os has retracted above the head of the fœtus at the time when the decisive pressure is exerted, so that it is the vesico-vaginal septum which receives it and which subsequently perforates, occasioning the vesico-vaginal fistula. Finally, the bladder may be retained above the pubes, the urethra being extended, so that it is subjected to pressure producing the urethro-vaginal fistula. Verneuil[4] has given the name urethro-cervico-vaginal to those fistulæ in which the neck of the bladder and the urethra are simultaneously involved.

The vesical orifice of the ureter is situated about three centimetres below the vaginal portion of the cervix, and these canals have, as has been said, a short intra-parietal course. It will be seen that, as a consequence, compression exerted at a point between the superior and the inferior portions of the bladder may result in either uretero-uterine (or, more exactly speaking, a uretero-cervical[5]) fistula or a uretero-vaginal fistula, according to whether the abnormal opening be situated in the neighborhood of the cervix or lower down in the vagina.

Of all fistulæ, the vesico-vaginal is the most frequent. It is situated as a rule very high up in the cul-de-sac. The opening is sometimes so small as to make it difficult of discovery; at other times it forms a wide orifice, generally oval in form, and in direction transverse or oblique. Its edges are in some cases flexible, in others hard and sclerotic, and are formed by the union of the two mucous membranes; that of the vaginal mucous border is usually curled inward forming, according to the expression of Verneuil, a species of entropion. The orifice is, as a rule, single, but there may be several openings separated by hardened or cicatricial bands. Finally, there are cases in which the vesico-vaginal septum has been completely destroyed, so that there exists what Deroubaix[6] has called a uro-genital cloaca.

The vagina often bears the incessant contact with the urine very well, but it may be the cause of a chronic vaginitis of the most distressing character. The canal often presents cicatricial bands resulting from sloughs coincident with the fistula. These may by retraction form a diverticulum with stagnation of urine and the formation of calculous concretions. One of the most unhappy complications of the fistula, from the point of view of its treatment, is the presence of cicatricial tissue uniting the walls of the vagina firmly with the pelvic bones. The urethra is sometimes included in this cicatricial tissue; it may be deviated from its course, retracted, or even obliterated. Where the perforation is large, the bladder is widely open and the mucous membrane, irritated by exposure to the air and the vaginal secretions, becomes inflamed; further, as its rôle of urinary reservoir is lost, contraction develops.

In the case of fistulæ situated in the vaginal trigone of Pawlik (Fig. 87, Vol. I.), we can penetrate with a probe or an appropriate sound into the ureter[7] which opens either upon its free margin or a little beyond it into the bladder; it is probable that there exists in such cases a certain degree of ureteritis which, according to Sänger, would be recognizable to the touch. Freund,[8] in an autopsy upon a uretero-uterine fistula, found the ureter dilated, as in a case of hydro-nephrosis, and with marked contraction below the fistula.

Simple uretero-vaginal fistulæ without simultaneous communication with the bladder are very rare. Most frequently the perforation of the ureter is secondary to a vesico-vaginal fistula. In the same way the uretero-uterine fistulæ are but a variety of the vesico-uterine or vesico-cervical, in which as a result of cicatricial contraction the wounded ureter comes into contact with the cervix which has been more or less injured and communicates with the bladder.

In the course of time the part of the fistula which had relation with the bladder may become obliterated by progressive concentric contraction, while the portion into which the ureter opens persists because of the continual dropping of the urine from this canal.

All ureteral fistulæ are of an inveterate character, or, if one may so express it, are always half cured. Hence the difficulty in finding the small orifice in the fossæ and cicatricial tissue.

If the fistula is urethro-vaginal, it is located near the vulva, between three and five centimetres of the meatus. A fistula of this kind may precede a vesical fistula and the urethra be obliterated between the two openings. These fistulæ may be very small or of large size.

As a rule, metritis is present where a urinary fistula keeps the cervix in a state of constant irritation. The alteration of the vaginal portion by sclerosis and ulceration may be considerable. In one case it actually resembled a nodular cancer.

Symptoms.—After a difficult or instrumental delivery we often have involuntary evacuation of urine; it is possible that this is due to a laceration of the vesico-vaginal wall, but is quite as probably dependent upon a traumatic paralysis of the neck of the bladder which antedates the slough sometimes by several days.

The date assigned by the patient for the appearance of the trouble is then of little importance; nor is it necessary to conclude with Deroubaix that in the majority of cases the fistula makes its appearance immediately after delivery. The incontinence of urine and the appearance of the fistula are not necessarily contemporaneous, as the patient is apt to think. Not until the third or the fourth day is the slough soft enough to permit the escape of urine. At first this will be in an inappreciable quantity, increasing with the amount of tissue detached; this process has sometimes been deferred as long as a month. The amount of the urine lost will vary with the dimensions of the orifice; while the alterations in quality, such as the addition of muco-pus or phosphates, are dependent upon a concomitant cystitis. The decubitus of the patient will influence the amount of urine thus discharged. Verneuil[9] has seen a case in which urine was lost only when the patient lay upon the side. We can easily see that, in the case of a fistula of the base of the bladder, retention would be possible, in the upright position, of fluid, which would at once escape were the perforation nearer the neck. The position of the edges of the wound, as well as that of neighboring cicatricial ridges, will also have an influence.

In the case of urethro-vaginal fistula, urine is discharged into the vagina only at the time of micturition. In the uretero-vaginal or uretero-uterine fistulæ the urine secreted by one kidney accumulates normally in the bladder, while that secreted by the other filters away drop by drop, or by a small stream, into the vagina. This perpetual involuntary discharge constitutes a veritable martyrdom for the patient, causing a constant wet condition and a penetrating odor which nothing will control, while the vulva and nates are the seat of a most distressing irritation.

The general health may be preserved; it may, however, be profoundly affected by extension of the inflammation along the genito-

urinary tract, giving rise to metro-salpingitis or pyelo-cystitis. Amenorrhœa[10] has often been noted. Sometimes, however, conception and normal delivery occur.

Diagnosis.—If immediately after labor we have an involuntary escape of urine, we need not at once conclude that we have a urinary fistula, for, as I have already said, such an escape of urine may be due to a paralysis of the neck of the bladder or even of the body of the bladder, with consecutive over-distention. A careful examination, and if still in doubt an injection of milk into the empty bladder, with decide the point. If there is the least perforation, the liquid will appear in the vagina.

A digital examination is sufficient for the determination of large fistulæ, especially if combined with catheterization with a metallic sound. Examination by the speculum is, however, essential for the precise location of certain perforations of very small calibre.

To examine for fistula, first place the woman in the lateral or Sims' position, then in the genu-pectoral, depressing the fourchette and exposing the lateral walls with appropriate specula. The latter position is most favorable for bringing into view the anterior wall if at the same time we fix the cervix and draw it slightly down with the fixation forceps. The examination is under any circumstances difficult if the vagina is contracted, and can often be accomplished only by the aid of previous dilatation, either rapid or slow, according to one of the various processes of which I shall speak in connection with the treatment of these conditions.

When the vagina has been made sufficiently accessible, examination may be still further impeded by cicatricial bands and irregularities. We must smooth out the folds, and go with a fine probe into every suspected fossa. At the same time a metallic sound may be made to elevate the anterior wall of the bladder, and the woman should be told to make straining efforts.

In a doubtful case we should not omit to inject milk into the bladder. If the interior of the vagina be now examined, the milk may be found issuing from the opening; yet if this opening be very small, the point of emergence may be invisible. I would advise you in such a case to thoroughly dry the anterior wall of the vagina, and apply to it a piece of absorbent paper while the bladder is being filled. A spot of moisture on the paper will show the location of the orifice, which can easily be found with the probe.

If we have a cervico- or a utero-vaginal fistula, the introduction of

a sound into the bladder and of a probe into the cervix will be sufficient for demonstration if the fistula is of some size. If it is very small, we may inject the bladder with milk until the liquid rises to the level of the fistula, and appears at the external os. The diagnosis can be confirmed by dilatation of the cervix, and exploration practised simultaneously with catheterization of the bladder.[11]

In the case of uretero-uterine fistula, the urine is discharged by the cervix, as in the preceding case, and the diagnosis is at first impossible. We may have to resort to very minute tests in order to make the distinction. Injections of milk will not now traverse the cervix, unless the fistula be of the uretero-vesico-uterine variety, while dilatation by the laminaria tent may be followed, as in Freund's case,[12] by pain, vomiting, and fever, the results of obliteration of the canal through which one of the kidneys discharged.

An ingenious measure has been employed by Berdard. He made the patient urinate; then placed the patient upon a vessel and collected all of the urine passed by the vagina for two hours, subsequently evacuating the bladder by the catheter. He then compared the two quantities, and, finding them equal, decided that each came from a separate kidney. I believe that in a similar case examination for thickening of one of the ureters according to Sänger's method would confirm the diagnosis and reveal ureteritis at the location of the lesion. Catheterization according to the methods of Simon and Pawlik may be practised if we can gain access to the cervix, but we must remember that the ureter often contracts below the perforation, so that it is penetrated with difficulty.

We may conjecture that we have a uretero-vaginal fistula, where the orifice is one or two centimetres from the cervix, upon the vaginal wall, in the neighborhood of one of the lateral boundaries of Pawlik's triangle.

When the fistula is simply of the uretero-vaginal variety, the orifice is very small, and the margins abrupt or hidden by a granulation. When, as is more frequent, the fistula is of the uretero-vesico-vaginal variety, the orifice may be very large. We should seek for the ureter upon one of its lips, being guided by the recognized relations of this canal. Sometimes we may see the urine coming from it in little jets. We should search with the ureteral sound (Fig. 88, Vol. I.) in the neighborhood of the posterior border, if the opening is not otherwise discovered. The penetration of the sound for a considerable distance, its direction toward the kidney, and the discharge of limpid

urine at a time when the bladder contains an injection of milk will remove all doubts. I have in a case of this kind introduced Pawlik's sound to a depth of eight inches.

Urethral exploration by catheterization should always be conducted with great care. I have used for the purpose a small elastic sound which easily follows the deviations of the canal. It is necessary to guard against possible error pointed out by Hegar and Kaltenbach. The urethra was obstructed in its posterior portion between a urethro-vaginal and a vesico-vaginal fistula. The sound passed into the vagina through the urethral orifice and entered the bladder by the vagina. It is only necessary to recognize this source of error in order to avoid it.

The cervix in these cases is sometimes affected with chronic inflammation, hard, nodular, increased in size, covered with ulcers that have a perpendicular margin and a shining appearance similar to that of certain varicose ulcers of the legs, and giving the impression of a malignant growth. We need not hastily conclude that we have to do with a cancer of the cervix; the lesions will disappear or at least be greatly ameliorated after obliteration of the fistula.

Prognosis.—Spontaneous recovery from urinary fistulæ[18] occurs only very early during the stage of concentric cicatrization which succeeds the discharge of the slough. At this stage one is sometimes surprised at the rapidity with which even large perforations diminish in size or disappear. In the course of time, however, this process of cicatricial reformation terminates. The perforation has now definite margins formed by the epithelium of the two mucous membranes united on their free borders; and there is no further spontaneous tendency to cure. Fistulæ are an infirmity rather than a disease, their gravity consisting in inflammatory complications involving the bladder and uterus, with frequent extensions to the kidneys, the Fallopian tubes, and the peritoneum. Ureteral fistulæ opening into the cervix are especially liable to these complications.

The curability of the different varieties of fistulæ varies with their location, extent, duration, and the condition of the vaginal mucous membrane.

Fistulæ of the base of the bladder are treated with greater facility than vesico-vaginal fistulæ or even those of the urethro-vaginal variety, which *à priori* should be easily curable. Vesico-cervical fistulæ are most rebellious to treatment. All of the ureteral fistulæ, whether opening into the vagina or the cervix, are extremely difficult to treat,

their obliteration even exposing the patient to new dangers from the possibility of resulting diminished permeability of the ureter itself.

Treatment.—Urinary fistulæ in women were described toward the end of the sixteenth century by Séverin Pineau.[14] His treatment by vivification and suture was recommended in the seventeenth century by the Dutch surgeon Von Roonhuysen,[15] but the operations failed for the want of a good technique, so that in the eighteenth century all curative treatment was abandoned, and Jean Louis Petit[16] applied in such cases a kind of urinal which he called "trou d'enfer." Desault and Choppart[17] limited treatment to the permanent catheter and the vaginal tampon in the early stage, to favor spontaneous cicatrization. At the beginning of the nineteenth century[18] various tentative operations were practised. Delpech, Dupuytren, and Jules Cloquet recommended cauterization. The suture was tried anew by Lewisky in 1802, by Naegele in 1812, by Lallemand, Deyber, and Malagadi of Bologna in 1828, by Roux in 1829, and by Dugès in 1830. Lallemand[19] in 1824 invented his famous "sonde érignes" or "sonde unissantes," the object being to unite the margins of the fistula, after previous vivification by the cautery. The alleged success of Lallemand, although contested, caused an enthusiastic adoption of these hooks, or "érignes unissantes." Dupuytren[20] constructed an instrument of this character, and Laugier[21] a little later invented a double vaginal hook. Récamier constructed several uniting instruments, but their popularity was temporary, and soon they were altogether abandoned in favor of autoplasty.

In 1832 Velpeau proposed to close laryngeal fistulæ with a skin graft, recommending the same procedure for other fistulous openings. This recommendation was adopted by Jobert (de Lamballe)[22] and in 1834 he operated by elytroplasty or autoplasty of the vagina. He first revivified the fistula with a bistoury, then replaced the lost tissue by a cutaneous graft derived from one of the labia, the internal surface of the thigh, or the buttocks. This graft was sustained in contact with the fistula by a suture passed into the urethra. He obtained a good result, but subsequently numerous reverses marked the operation both in his hands and in those of Roux, Velpeau,[23] Leroy, and d'Etiolles.[24] Gerdy[25] also invented an autoplastic method, which merits preservation for certain special cases. It consists in the detachment of two quadrilateral flaps from the borders of the perforation and the exact union of their bleeding surfaces.

None of the different methods, however, had given any but uncer-

tain results, when Jobert[26] proposed an operation which marked an epoch in the history of the cure of fistulæ. This was the operation of cystoplasty *par glissement*, or vaginal autoplasty by flaps. He had a series of successes, which were very extraordinary for the times. Jobert wrongly attributed these to the facility afforded for bringing the margins together and the absence of tension. In reality they were to be ascribed to details of technique which he considered accessory only, but which from their influence were of capital importance in the result. They consisted in the obtaining of a good view of the operating field by means of flat retractors, freshening of a large surface of the borders of the fistula, and the insertion of many sutures. Those surgeons who, like Jobert, failed to appreciate the importance of these details, were not successful in their operations, and only its author had good results with cystoplasty *par glissement*.

In Europe the first enthusiasm excited by Jobert's publications was followed by complete discouragement until toward the end of the year 1858, when a young American surgeon, Bozeman,[27] exhibited in Paris a slight modification of the operation of his teacher, Marion Sims,[28] of New York. This American procedure, which had previously been touched upon in some of its points by other physicians, and by Hayward,[29] of Boston, in particular, consisted of the following improvements upon other methods. The semi-prone lateral position; the use of large specula of trough-like form which serve as depressors and at the same time as reflectors; revivification of a very much larger area than had been previously thought necessary, for the accomplishment of which he recommended a complete armamentarium of instruments; sutures with many stitches of silver wire (at the same time strong and aseptic); and a special permanent metallic catheter.

The extraordinary success obtained by Bozeman in the hospitals of Paris excited the enthusiasm of French surgeons. Follin and Verneuil in particular popularized the American method by their operations and practice.[30] Three years later (November, 1861) Marion Sims[31] himself came to Paris and operated in the service of Velpeau.

At the same time Baker Brown[32] and Simpson[33] obtained in London and Edinburgh similar successes, and Simon,[34] of Rostock, modified certain manual details. He employed silk sutures, demonstrating that silver wire was not essential to the result; he formulated definite rules for vivification; and finally, in cases incurable by the usual procedure, he applied the method called colpocleisis or transverse obliter-

ation of the vagina—an operation of which, in truth, Vidal de Cassis [35] had conceived the first idea.

The therapeutics of urinary fistula in the female were henceforth established, and the more recent works on the subject have merely elaborated the descriptions.

If we review the history of the operations which have been applied to the cure of vesico-vaginal fistulæ, we shall easily distinguish several periods: 1. The old period or that of experimental operations, which extends from Von Roonhuysen's attempt at suture to the first essays of Jobert; surgical knowledge then passed successively in evolution through the stages of the suture after revivification to cauterization, then to the use of instruments to promote union after revivification by caustics, and finally to autoplasty. 2d. A period of transition marked by Jobert's operation of cystoplasty *par glissement*, and by the indirect process of infibulation by Vidal de Cassis, followed by Berard. 3d. A period of the renaissance of the suture—the old operation of Von Roonhuysen, to which has been attached the names of Hayward, Sims, and Bozeman in America; of Simpson and Baker Brown in England; of Simon and of Hegar in Germany; of Neugebauer, in Warsaw; Follin and Verneuil in France, etc.

Operative Indications.—When is the best time to operate? Hegar and Kaltenbach have fixed upon the sixth to the eighth week after delivery. At this period the lochial discharge has disappeared, the slough has been eliminated, and the margins of the fistula are sufficiently vascular and firm. Earlier than this, we risk an unfortunate result by exposing our wound to a vaginal discharge, also from operation upon tissues too friable and over-gorged with blood; later, to the difficulties associated with retracted and sclerotic tissues. Age does not constitute a contra-indication. Simon has operated with success upon a child of eight years in whom the fistula was provoked by a large vesical calculus; Hegar has operated upon a woman of sixty, who had suffered from her fistula for thirty-five years.

A bad general condition is evidently unfavorable for the success of a plastic operation. Hegar, however, did not hesitate to operate upon a hemiplegic patient. In spite of the successes of Watson and Baker Brown, [36] it seems to me imprudent to operate during pregnancy. The time immediately following menstruation is to be preferred.

Operation in all vesico-vaginal and urethro-vaginal fistulæ will relieve incontinence of urine by one of two methods: 1st, direct ob-

literation of the fistula; 2d, obliteration of the genital canal below the situation of the fistula, so as to incorporate it with the urinary reservoir. The last procedure is of course only a last resort.

Direct Obliteration of the Fistula.—I shall not dwell upon cauterization, which for a long time was the surgeon's only resource and was practised by means of the most various agents. It is now reserved for small recent fistulæ, and particularly for those presenting an oblique canal. We use preferably the galvano-cautery, first inserting the non-heated platinum the whole length of the canal. Nitrate of silver is applicable where the opening is very narrow; it is a good auxiliary, too, to actual cauterization after the separation of the slough.

Intermediary between cauterization and operation by suture we place the process of revivification by caustics, followed by suture, sometimes designated as immediate secondary reunion. The following description is furnished by its principal exponent, Amabile, of Naples.[37]

The woman being placed in the dorsal position, the buttocks are elevated, and the fistula is brought into view by means of a modified Sims' speculum fixed to the operating-table. The margin of the fistula is scarified for a distance of about two-fifths of an inch. The object of the scarification is simply to allow the caustic to act more energetically. Amabile uses sulphuric acid for this purpose. He repeats the cauterization at the end of three days, and follows with nitrate of silver to facilitate separation of the slough. At the end of about twelve days he has a granulating wound which he brings into apposition with an instrument called the "griffes en rateau" or rake-catch of Amabile. He leaves this in place for from five to seven days.

It will be seen that we have here a veritable return to the archaic procedure of Lallemand, Laugier, and others. Experience does not justify it as a general method; at the same time it may be practised under special circumstances. For instance, it may be applicable where treatment is attempted during the first days which follow the separation of the slough; we should then probably have direct union of the granulating surfaces; in such cases sutures seem to me preferable to the serres-fines or to the greffes.

Primary union of the previously vivified fistula is the operation which has been substituted for the preceding methods.

Preparatory Treatment.—To Bozeman belongs the credit for having suggested dilatation in cases where narrowness of the canal and

cicatricial bands are present. He produces the distention gradually by a series of ovoid hard-rubber balls used during several days. He aids their action by incision of the cicatricial tissues. With patience, the most surprising results may be obtained. Simon and his pupils

FIG. 71.—NEUGEBAUER'S SPECULUM FOR THE OPERATION OF VESICO-VAGINAL FISTULA.

prefer rapid dilatation. He first incises the fibrous bands and masses with the bistoury, and then dilates by introducing one after another specula of gradually increasing size. Local cocaine anæsthesia may be used. It is also desirable to overcome erythema, excoriations, and cystitis before proceeding to the plastic operation. This is effected by means of lotions, injections, and baths.

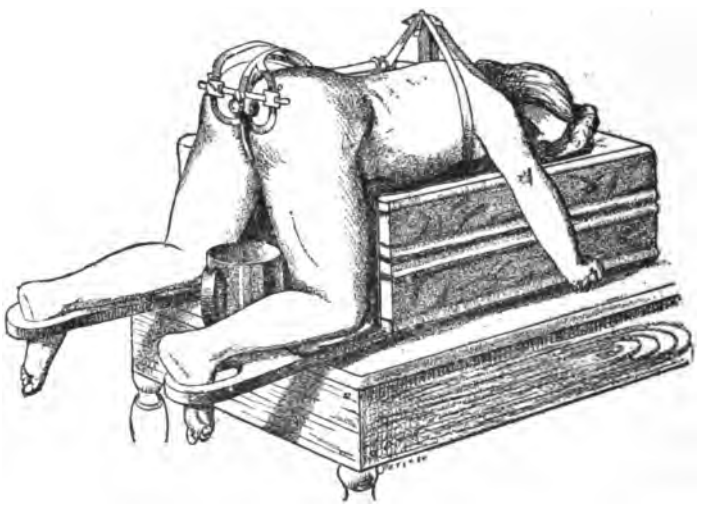


FIG. 72.—NEUGEBAUER'S SPECULUM IN PLACE. PATIENT IN POSITION UPON THE OPERATING-TABLE.

Where we have contraction or obliteration of the urethra we should first treat these conditions. For the first we may resort to divulsion or the long-continued use of the sound. In case of obliteration of the urethra we may do an operation analogous to that of external urethrotomy in the male; the cicatricial tissue is first to be excised, after which the vaginal mucous membrane, liberated by means

of incisions and dissections, may be sutured about a permanent catheter so as to form a new canal.

Operative Technique.—1*st. Examination for Fistula.*—The position to be given to the patient will vary with the height of the orifice. The dorso-sacral position is available where the fistula is very low or where there is at the same time prolapse of the vaginal wall. As a rule, however, Sims' position or that of semi-pronation will be required. Where the fistula is located high up, the genu-pectoral

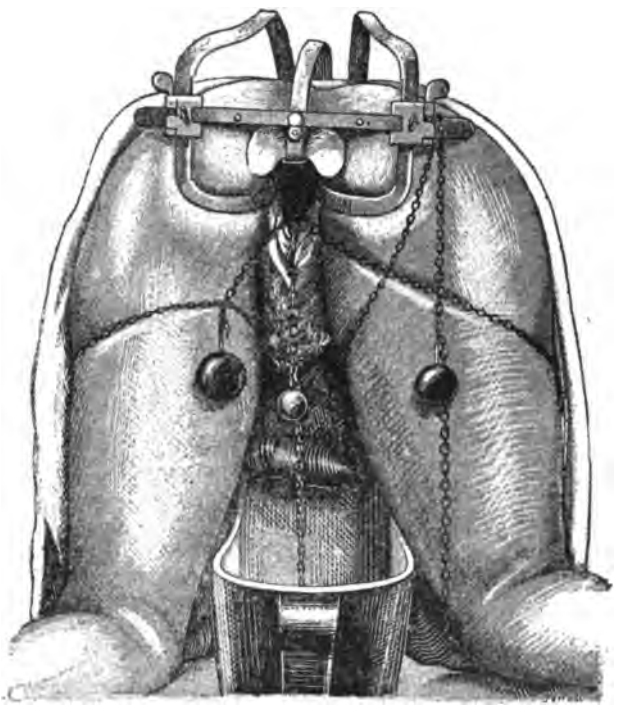


FIG. 73.—NEUGEBAUER'S SPECULUM AND HOOKS FOR RETRACTION IN PLACE.

position will be necessary. This possesses the drawback of being uncomfortable and of rendering the administration of the anæsthetic difficult, notwithstanding the use of special operating-tables. The patient is fastened to the table by Bozeman,[88] and simply placed in position by Neugebauer,[89] who has a self-retaining speculum held in place by a belt, also hooks and chains to which are suspended weights so as to stretch the parts included in the operative field.

General anæsthesia by chloroform has always been used for this operation. It is probable, however, that cocaine applied by compresses or by submucous injection might be used with success, and

general anæsthesia be dispensed with. Two assistants are required; one to expose the vaginal wall and control bleeding, and the other to handle the sutures. The operation may be performed under continuous irrigation with lukewarm sterilized water; and we may, if necessary, use in the place of sponges moistened absorbent cotton carried by the forceps.

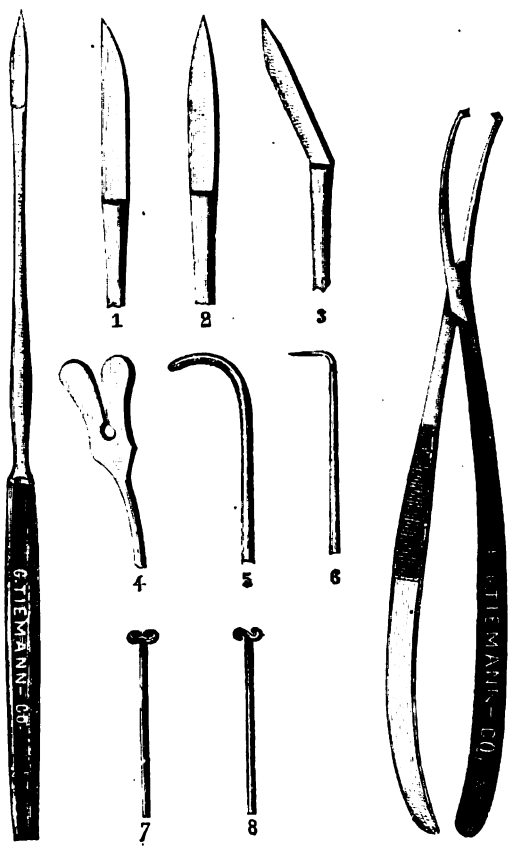


FIG. 74.—INSTRUMENTS USED FOR VIVIFICATION AND SUTURE IN VESICO-VAGINAL FISTULA. 1, 2, 3, Straight, convex, and bent bistouries; 4, spatula; 5, 6, blunt and pointed hooks; 7, 8, Coghill's wire twister, and Denouvillier's S-shaped wire twister; 9, Collin's spring forceps.

The fourchette should be depressed by a short and broad-bladed Simon's speculum; a retractor can be used to elevate the anterior vaginal wall if necessary; a metallic sound introduced into the bladder may be used to bring the base toward the operator; finally, the cervix is fixed and brought down by Museux forceps.

Second Stage.— Vivifying the Lips of the Fistula.—For this purpose a bistoury having a straight or angular blade is to be preferred.

The scissors, so ingeniously varied in curve by Sims, do the work more rapidly, it is true, but sometimes bruise the tissues. Denudation may be accomplished in two ways. In ordinary cases, where the mucous membrane in the neighborhood of the orifice is in a healthy condition, we make an infundibuliform denudation, following the

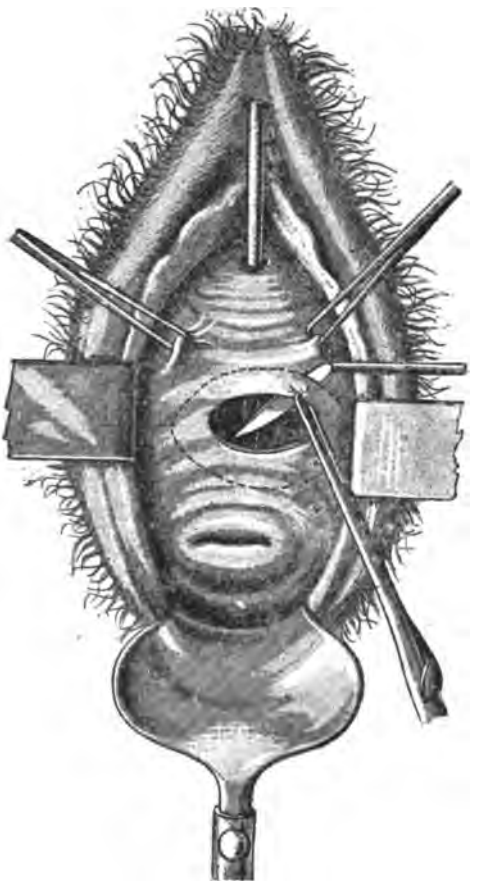


FIG. 75.—VIVIFICATION IN VESICO-VAGINAL FISTULA. (The tenaculum which holds down the cervix has been omitted.)

practice of Simon (Fig. 76, *m*, *n*). Simon takes no special precautions for the protection of the vesical mucous membrane, and the bistoury removes all of the cicatricial tissue. In the case of extensive cicatrices it is better to prepare for denudation according to the American method (Fig. 76, *x*, *y*). The bistoury, directed obliquely, should be inserted at about one-fifth of an inch from the edge of the orifice, in such a way that its point perforates the tissues at the line

of union of the vaginal with the vesical mucous membrane so as to pass beyond the cicatricial tissue which is removed. The Americans consider it most important not to wound this tissue, as it bleeds freely.

In making the incision the mucous membrane is put on the stretch by means of tenacula and toothed forceps, a complete collar is outlined about the fistula and detachment is completed with the scissors (Fig. 75). Where the margins are hardened, bleed but little, and have but a moderate degree of vitality, the denuded surface is to be increased, the ring of mucous membrane being removed to a depth of about an inch. This American procedure has but one disadvantage—that of tension after the application of the sutures. In a small fistula, denudation should take an elliptical form, and should be directed so

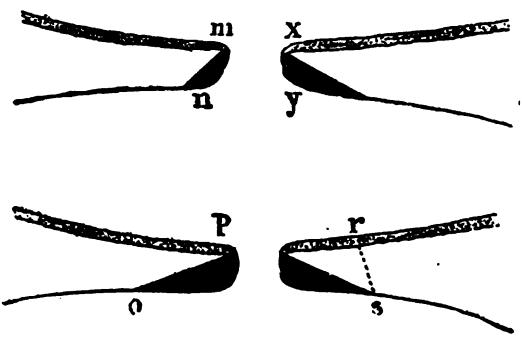


FIG. 76.—VIVIFICATION IN VESICO-VAGINAL FISTULA. *m*, *n*, Infundibuliform denudation with narrow base (Simon); *x*, *y*, conical denudation with broad base (American method), saving the vesical mucous membrane; *p*, *o*, American method of denudation, showing the area of tissue preserved when a large mass of cicatrical tissue is freshened. In Simon's process this would be excised as shown by the line *r s*.

as to produce the least tension. Internal hemorrhage is guarded against by avoiding the vesical mucous membrane. Sometimes, however, the wounding of an arteriole is unavoidable; it is then better to stop the bleeding by direct compression of the denuded surface by the fingers. If that do not succeed, it is better to trust to suture than to seize vessels in the wound. The same rules for vivification apply both to vesico-vaginal and to urethro-vaginal fistulæ.

When the fistula is situated near the cervix, it is well to incise the anterior lip of the cervix or even to remove a cuneiform segment so as to give access to the fistulous orifice. Then denude for a certain distance about the opening, as in the case of other fistulæ; and if there is too much tension, instead of making free incisions, it is better to use the scissors and separate the mucous membrane from the underlying tissues for a certain distance around the wound.

Third Stage.—Suture.—Some operators use mounted needles,

tubular needles, either Simpson's or Sims'; Startin's chasse-fil needle or Reverdin's needle. While convenient, all of these instruments make too large a wound. I myself use exclusively the fine flat Hagedorn needle, carried by my own needle-holder. Sutures of fine, strong silk or of silver wire are preferable to catgut, which is too rapidly dissolved, while the silkworm gut is too stiff.

First pass the deep sutures. Excluding carefully the vesical mucous membrane, pass your needle under the whole of the denuded surface, bringing it out about a tenth of an inch from the margin of the wound. The ends of the sutures should be immediately secured with forceps. To obtain exact closure, insert superficial sutures between the deep or supporting sutures. Use a very fine thread and bring it out as close to the margin of the wound as possible, tying

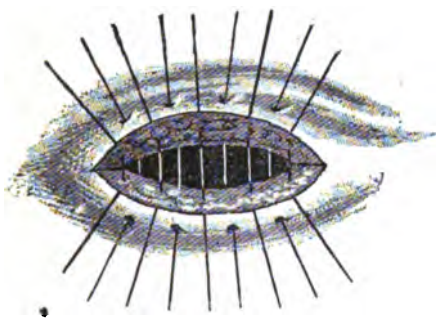


FIG. 77.—SUTURE OF VESICO-VAGINAL FISTULA; DEEP AND SUPERFICIAL SUTURES IN PLACE.

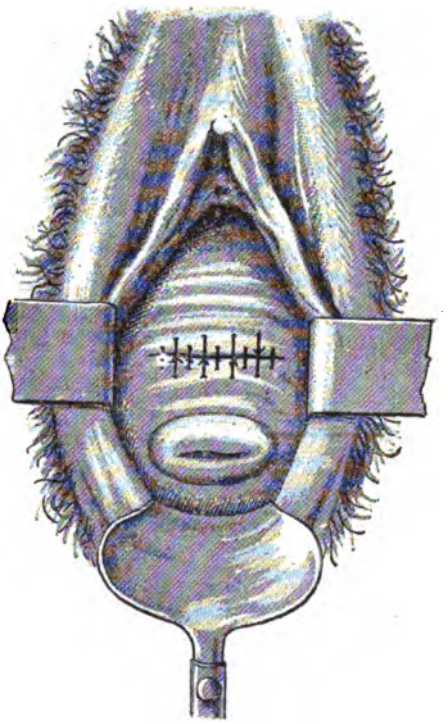


FIG. 78.—SUTURE OF VESICO-VAGINAL FISTULA; SUTURES TIED.

it at once (Fig. 77). Then tie the deep sutures. If silver wire is used, it can be gently brought together and then twisted with a wire twister (Fig. 74). In passing the sutures we may use mouse-toothed forceps, blunt and sharp hooks, and a little forked instrument; a catheter is to be kept in the bladder. We prefer a transverse direction where it is possible to choose the line of the sutures. If the perforation is extensive, it may be best to give it the direction of the letter Y, or that of a double Y united by the stems (Fig. 80).

Various Modifications of the Operative Technique.—I have just

described the general process of denudation and suture which is, in its essential features, what Verneuil and Follin call the American method. Certain special conditions call for modifications of this technique. I shall describe them briefly, and shall indicate also certain peculiarities in the practice of different operators which should not be passed over in silence.

First Stage. Exposure of the Fistula.—In order to limit the number of assistants, several operators have invented self-retaining specula. Bozeman first constructed an instrument of this kind which has served as the pattern for a number of others. Neugebauer's apparatus (Fig. 71) is fixed to the patient's back by straps (Fig. 72), and the hooks, chains, and weights serve to put the parts upon stretch without the aid of assistants (Fig. 73). Simon depresses the cervix by passing loops of silk through the lips; these take up less space than forceps. The larger number of surgeons who fix the cervix, a detail which I consider indispensable, use for the purpose Museux forceps or ordinary extraction forceps. Forceps may also be used in the place of the tenaculum for fixing the mucous membrane in the neighborhood of the operative field (Fig. 75).

FIG. 79.—OPERATION FOR VESICO-VAGINAL FISTULA SITUATED NEAR THE CERVIX. Incision of the anterior lip in order to make the fistula more accessible. The inner dotted line shows the surface to be freshened around the fistula. The outer dotted line A B shows where the mucous membrane may be separated, when necessary, to relieve tension. The patient is supposed to be in the genu-pectoral position (Emmet).

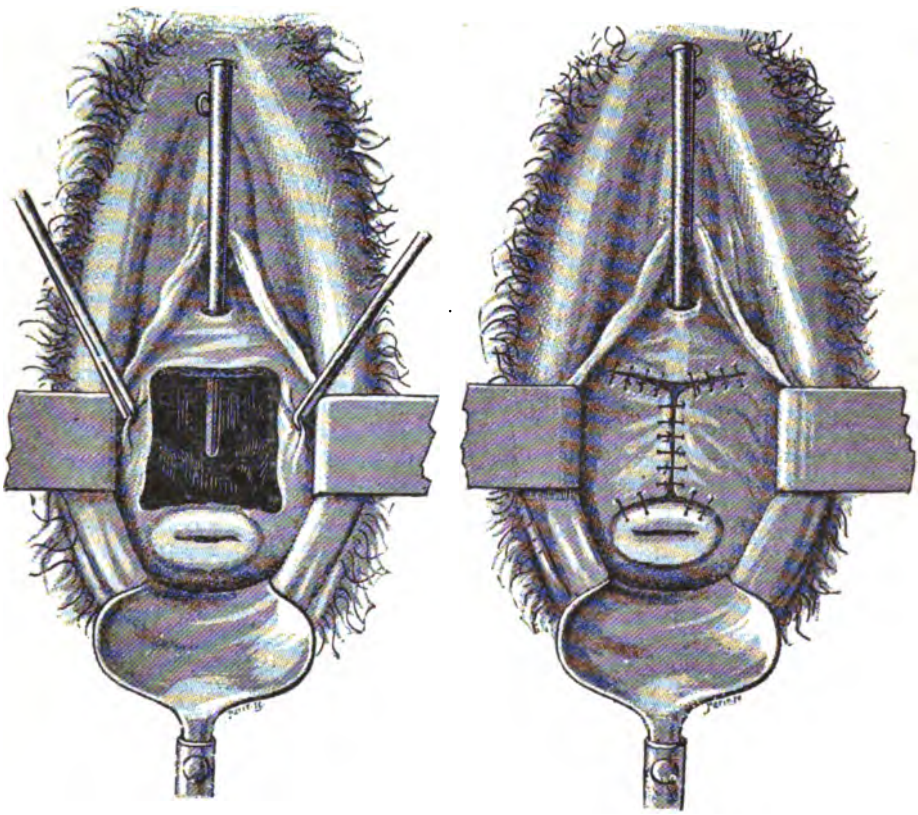
Second Stage.—Denudation.—If we have a very large perforation or if the margins are specially vascular, it is better not to denude the whole of the border of the fistula at once, but to denude and suture a limited portion at a time.[40] If the case is very difficult, requiring much time, it is better to do a partial operation, and repeat it several times. The duration of the operation is an important consideration on account of the prolongation of anæsthesia, which is prejudicial to the patient; and also on account of the fatigue to the operator; it is a matter not to be lightly passed over when we have in hand an operation demanding minute attention.

If two fistulæ are adjacent and separated by cicatricial tissue, they must be united; if the bridge of mucous membrane is flexible and has a good degree of vitality, we must endeavor not to injure it.

When the vagina is narrow and does not furnish tissue for a sufficient denudation, we may have recourse to a flap-splitting process,

which is the basis for Lawson Tait's operation for perineorrhaphy and which was primarily applied to operation for vesico-vaginal fistula.[41] I shall speak later of the service which it has rendered me in the treatment of uretero-vaginal fistula.

When there is a very large perforation with a considerable loss of tissue, it may be necessary to have recourse to flaps derived from the vicinity, or autoplasty. This operation, often confounded with



FIGS. 80 AND 81.—EXTENSIVE QUADRANGULAR VESICO-VAGINAL FISTULA, BEFORE AND AFTER FRESHENING AND SUTURE.

that of flap-splitting, was used by Jobert, Gerdy, and others. It found a warm partisan at a relatively recent period in Duboué,[42] who proposed to incorporate it with the American method. This surgeon forms two small flaps at the expense of the vaginal mucous membrane by division of the septum, securing them with wire twisted about ivory buttons.

Recently this operation of autoplasty by division has been revived in Germany by Von Herff, Sänger, Fritsch, and Walcher.[43] The last-

named, who has described the technique at length, unites the vesical orifice with catgut, using silk for the vaginal wound.

We should add to the autoplastic operations that of obliteration of a large fistula by a plug formed from the vesical mucous membrane, as practised by Lannelongue.[44] In a case where the whole vesico-vaginal septum was destroyed, and where the posterior wall of the bladder had engaged in the fistula, he utilized the obturator thus offered; and after having denuded the vesical mucosa for a sufficient distance he fixed it to the previously denuded anterior lip.

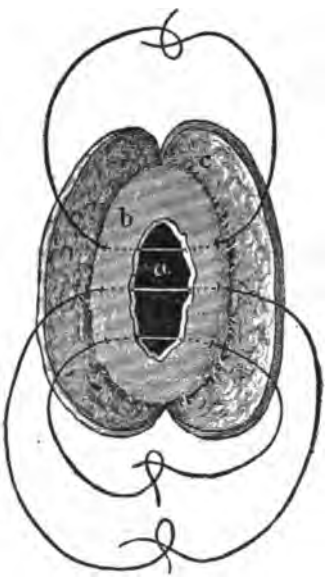


FIG. 82.—FLAP-SPLITTING OPERATION IN VESICO-VAGINAL FISTULA (WALCHER). *a*, Fistula; *b*, vesical wall; *c*, vaginal wall.

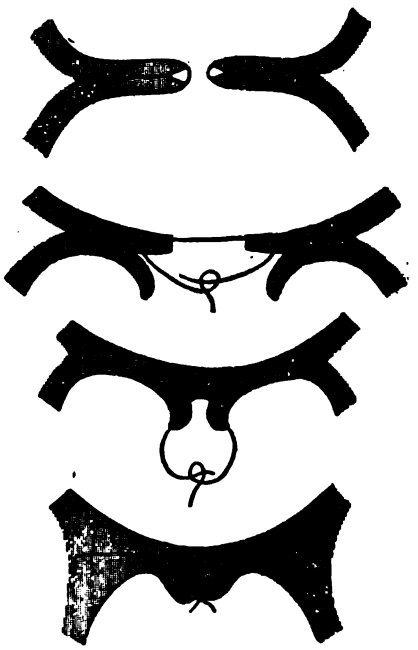


FIG. 83.—FLAP-SPLITTING OPERATION FOR VESICO-VAGINAL FISTULA. SCHEMA OF THE SUCCESSIVE STEPS OF THE OPERATION (WALCHER).

Autoplasty, however, renders its most signal service in urethro-vesical fistulæ with a great loss of tissue. Marked successes of this kind have been reported by Houzel,[45] by Polaillon,[46] and by Fritsch.[47]

Third Stage.—Suture.—Sims, in twisting his suture, used a catch forceps having a right-angled extremity. This seized the two ends of the wire at the same time that they were made to engage in the groove of a long-handled shield (Fig. 84). The shield was pushed by the left hand along the wire in contact with the mucous membrane; torsion was then effected by rotating the forceps upon its axis.

Before removing the shield, he turned the wire in the direction of the vaginal outlet so that its ends should not wound the posterior wall. Sims placed in the bladder a self-retaining permanent sigmoid catheter of his own invention. Bozeman brings the margins of the wound together by a special instrument called a suture-adjuster. It consists of a long steel shank carrying a little flat disk pierced by a hole in its centre (Fig. 85). Through this hole he passes the two ends of a suture; with these in the left hand he slides the disk down to the wound in such a way as to secure its perfect coaptation and to

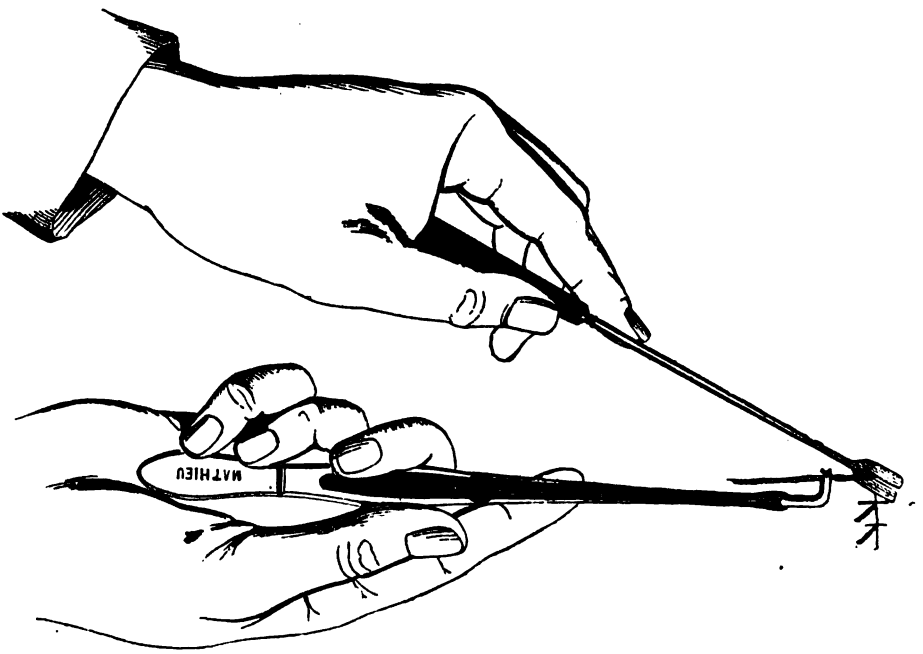


FIG. 84.—OPERATION FOR VESICO-VAGINAL FISTULA. Sims' twister and shield.

give to the wire a circular position, when it has only to be secured. Before the operation he prepares two or three small strips of lead, a millimetre in thickness and of a size adapted to the extent and form of the closed wound and hollowed out in the centre so as not to press upon its lips. He then pierces the leaden plate, punching in it holes to the number of his sutures, passing through each hole the two extremities of each separate suture, and then, bringing the plate into close contact with the vaginal wall, adjusts it with a special hook. He encloses the wires with the lead somewhat after the manner in which rubber tubing is used. Sims' catheter is left in the bladder. The

sutures are removed on about the tenth day, the patient being in the genu-pectoral position as for operation.

Le Fort places two rows of sutures—deep and superficial. The first is entered at the internal or deeper border of the denuded surface, and is brought out at a point somewhat distant from the external margin. This row is intended to bring into apposition the deeper portion of the wound. The sutures are fixed by rubber tubes placed about the extremities of the wires. After the deep sutures have been placed

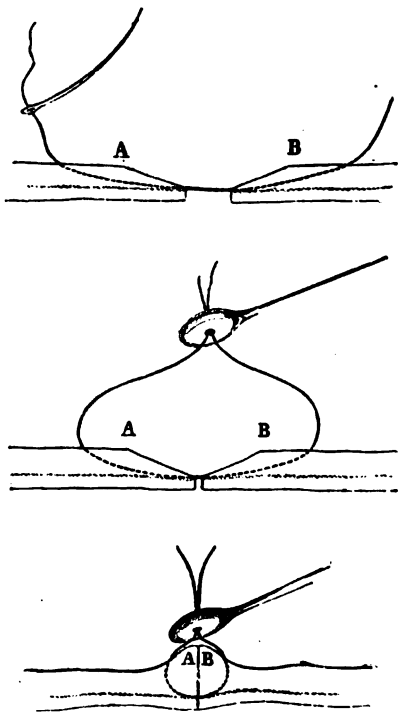


FIG. 85.—OPERATION FOR VESICO-VAGINAL FISTULA. Showing introduction of suture and use of Bozeman's adjuster.

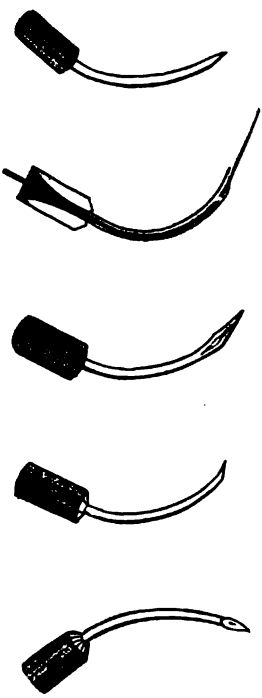


FIG. 86.—NEUGEBAUER'S NEEDLES.

and secured, the wound has a linear form and the superficial portion is easily coapted by a second row introduced along the margins and twisted.

Neugebauer has invented a needle-holder and curved needles mounted upon a polygonal base permitting any inclination. With his bed, his speculum, and the hooks, chains, and weights he has a complicated but ingenious armamentarium to which he attributes a large part of his remarkable success (Figs. 86 and 87).

After-treatment.—The operation terminated, wash out the vagina

with a sublimate solution (1: 2,000), and powder the line of suture with iodoform. Then place in the vagina a strip of iodoformed gauze to prevent wounding of the posterior wall by the silver wire or the silkworm gut which are to be preferred to silk, as the latter absorbs the vaginal and uterine secretions. We do not require any more elaborate dressing than this, which need not be renewed until after the removal of the sutures. Except in case of special indications these should be removed on about the eighth day, with precautions against reopening the wound. I think the permanent catheter invented by Sims useful for the first forty-eight hours. I attach to it a rubber tube, having its free extremity in a boracic-acid solution, the urine being thus evacuated by siphonage without the introduction of air.

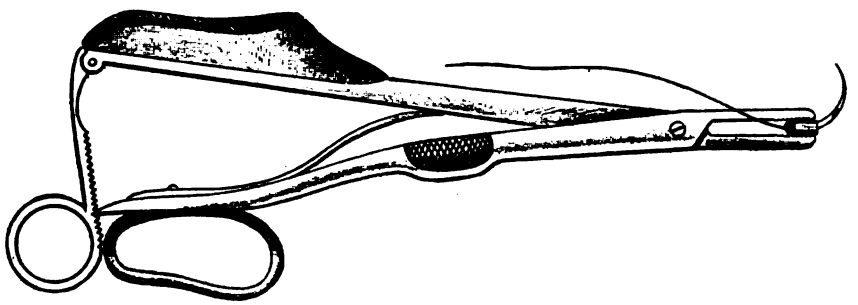


FIG. 87.—NEUGEBAUER'S NEEDLE-HOLDER.

Prolonged retention of the catheter is attended by danger of cystitis. It is better after the first two or three days to practise repeated catheterization every three hours day and night. If at the time of operation there be a vesical catarrh, or if this develop subsequently, it will be well to follow each catheterization with an injection of borated water, being careful not to produce too much distention of the organ, which is often much reduced in size. Catheterization should be continued for two days after the removal of the sutures, permitting urination upon the tenth or twelfth day.

Vaginal injections of sublimate solution may be used at this time night and morning. If a small aperture remain, touch the edges with the nitrate-of-silver stick, and spontaneous cicatrization will as a rule follow. If the opening is large, secondary union may be attempted by suturing together the granulating surfaces, having recourse again to the permanent catheter or to repeated catheterization. We should not resort to a second operation for at least a month after the first.

It is very important to keep the bowels free, but a restricted diet is not to be recommended.

If menstruation occurs shortly after the operation, as frequently happens, we simply renew daily the dressing of iodoform gauze placed in the vagina.

Indirect Obliteration of the Fistula.—This operation is applied in conditions where suture of a vesico-vaginal fistula offers no chance of cure. These conditions are found where there is an extensive slough of the urethro-vaginal septum, and where the vagina is largely filled up with cicatricial tissue, with marked alteration of the surrounding tissues. Adhesion between the fistula and the pelvis, complete loss of the anterior lip of the cervix—conditions which make wounding of the peritoneum during denudation probable—may also contra-indicate all experimental efforts at direct operation. These conditions determine total obliteration of the genital canal. In order, however, to obliterate the vagina without risking the production of hæmatometra or retention of the menstrual blood, the opening between the bladder and the vagina must be of large size; it may even have to be increased in size. Obliteration of the vagina, which is the operation to be chosen, and which I shall describe, has received the name of colpocleisis; that of obliteration of the vulvar orifice as practised by Vidal de Cassis, and to which we are exceptionally obliged to resort, the name of episiorrhaphy, a better name than that of episiostenosis. It is easy to apply to these the principles which I shall indicate for occlusion of the vagina.

The honor of reviving the indirect operation belongs to Simon,[48] who has also established the technique.

First Stage.—Denudation.—We should try to locate the obliteration as high as possible, as this guards against incontinence better than where the denudation is carried to the neighborhood of the urethra. It will be necessary to bear in mind, however, that to secure union the denudation must be made in vascular tissue, and to establish this condition it may have to be carried completely to the vulva. Vidal de Cassis made a practice of denuding the labia majora, but the objection to that is that it is difficult to obtain complete anterior union. In operating, remove a ring of mucous membrane about seven-tenths of an inch broad, carrying the dissection from above downward, putting the parts on the stretch with the aid of the forceps. The dissection of the posterior wall will be facilitated by having an assistant place a finger in the rectum, while that of the anterior wall

will be aided by placing a sound in the bladder. The surface of the wound should be carefully evened with the scissors.

Fritsch [49] has proposed to accomplish this denudation by division after a simple circular incision.

Second Stage.—Suture.—Large Hagedorn needles threaded with silk should be passed under the whole of the wounded surface from below upward, then from above downward. Care must be used that neither the bladder, rectum, nor peritoneum are perforated.

The first suture facilitates the remainder of the operation by assisting comparison of the parts to be united. Care should be used in placing the sutures, to avoid overlapping. Several superficial sutures will be required (Figs. 88 and 89).

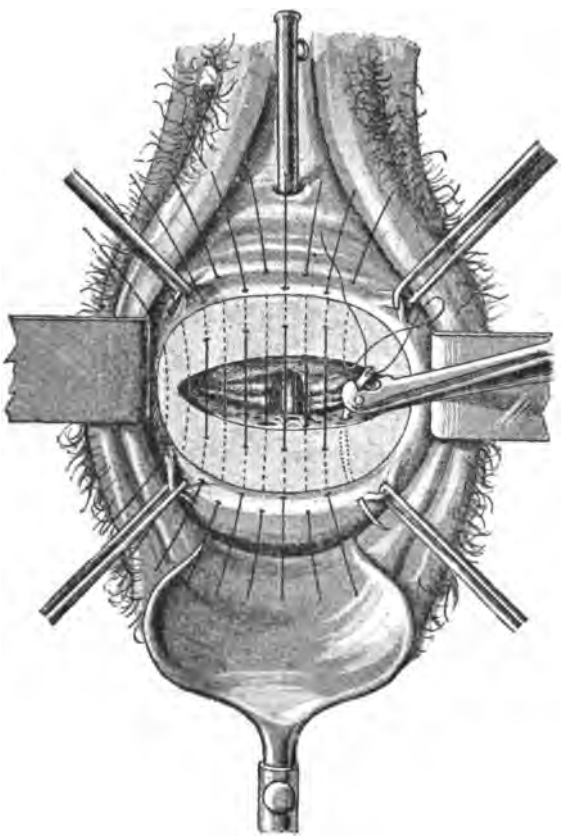


FIG. 88.—OCCLUSION OF THE VAGINA, OR COLPOCLEISIS: VIVIFICATION AND SUTURE.

FIG. 89.—COLPOCLEISIS. (Schematically drawn.)

In order to appreciate the importance of this operation, we should not lose sight of the miserable condition to which the woman is otherwise abandoned. Colpocleisis is often a valuable resource, although attended by inconveniences of its own; impregnation is impossible, and coitus cannot be practised as a rule, unless in the excep-

tional case where the obliteration is very high in the vagina. The menstrual blood may excite vesical catarrh and the contact of the cervix with the urine produce a metritis. Sometimes we have a pyelonephritis, and very frequently vesical calculi.[50]

When the neck of the bladder is injured so as to cause incontinence of urine, obliteration of the vagina alone is not sufficient to prevent constant dribbling. For the relief of such cases, it has been proposed to transpose the office of a urinary reservoir from the bladder to the rectum. In addition to colpocleisis a recto-vaginal fistula is established. Baker Brown[51] first performed this operation on a patient presenting a vesico-vaginal and recto-vaginal fistula with almost complete obliteration of the vagina and destruction of the

FIG. 90.—JUXTA-CERVICAL FISTULA; VIVIFICATION.

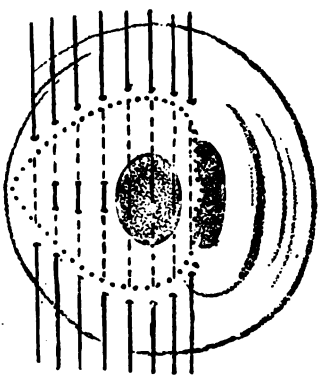


FIG. 91.—JUXTA-CERVICAL FISTULA; SUTURE.

neck of the bladder and urethra. Maisonneuve[52] in 1851 purposely produced a recto-vaginal fistula after obliteration of the vulva. In this case he hoped that the sphincter ani would retain the urine, which would of course have to pass per anum, but the fistula closed spontaneously, and an attempt to establish a perineal fistula was followed by death.

Rose[53] adopted this operation under the title of rectal obliteration of the vulva. He begins by establishing a permeable artificial recto-vaginal fistula a short distance above the anus, incising the recto-vaginal septum and carefully uniting the two mucous membranes. Cazin[54] and Schröder[55] have resorted to this operative procedure, which is not altogether free from danger. Serious complications have followed from the presence of intestinal gas and fecal matters in the vagina; further, we have in the recto-vaginal fistula itself a tendency

toward spontaneous obliteration. Nevertheless, Fritsch[56] knew of two patients operated upon by this method who passed their urine through the anus without the least inconvenience. One of these women, operated upon four years ago, was laundress in his clinic, and in no way suffered from the existence of her cloaca.

CERVICAL FISTULÆ.—Urinary fistulæ implicating the neck of the uterus are of two distinct varieties. In the first the fistula is simply tangential to the vaginal portion, which is more or less implicated in the destructive process. According to Jobert these should be included with vesico-vaginal fistulæ under the name vesico-utero-vaginal fistulæ and subdivided into two varieties, superficial and deep, according as the destruction of the anterior lip of the cervix is partial or complete. This nomenclature is, however, essentially defective. It is better, I think, to include these with fistulæ of the cervix under the name of juxta-cervical fistulæ, reserving the name intra-cervical fistulæ for perforations which are rather erroneously called vesico-uterine fistulæ. Juxta-cervical fistulæ are not to be confounded with fistulæ simply located in the neighborhood of the cervix which remains intact. One is in such a case sometimes obliged to incise the anterior lip in order to accomplish the denudation or even to remove a V-shaped segment (Fig. 79).

I. *Juxta-cervical Fistulæ* (Syn. *vesico-utero-vaginal*).—In the superficial variety, obliteration may be secured by a good denudation, but this offers here special difficulties, for posteriorly it must be to the sclerosed anterior lip of the cervix, which forms the inner boundary of the fistula. Anteriorly, the denudation must be carried to the upper part of the vesico-vaginal septum or even to the urethro-vaginal septum. The density of the tissues constitutes a very serious obstacle; it is better, especially, in the neighborhood of the cervix, to make a very large denudation, and without hesitating to remove cicatricial tissue which will interfere with union. It is better to vivify a very large surface than to have the result doubtful (Figs. 90, 91, and 92).

In the case of deep juxta-cervical fistulæ, we may not have room for denudation or to bring together the lips of the wound; denudation of the partially destroyed anterior lip presents special dangers from its proximity to the peritoneal vesico-uterine cul-de-sac, which may be fixed by cicatricial contraction. Hegar's[57] case in which he obtained direct union must be considered a happy exception and an example which it would be difficult to follow.

Deep juxta-cervical fistulæ which do not lend themselves to direct suture must be otherwise operated upon. The posterior lip of the cervix may be sutured to the anterior or vaginal lip of the fistula in such a way that the uterus opens into the bladder (Fig. 93). This operation might be called vesical hysterocleisis, to distinguish it from hystero-stomatocleisis where the lips of the cervix are sutured together. In this operation the denudation should not be carried from the cervix to the vaginal wall, on account of the danger of wounding the peritoneum. The cervix may be turned completely into the blad-

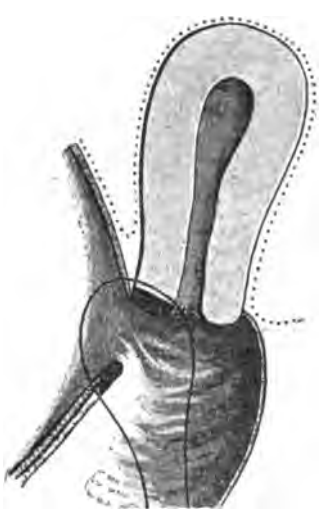


FIG. 92.—SUPERFICIAL JUXTA-CERVICAL FISTULA; VIVIFICATION. (Schematic.)

FIG. 93.—DEEP JUXTA-CERVICAL FISTULA. (Schematic.)

der, when the prominent posterior cul-de-sac may simulate a posterior lip. Denudation here would certainly penetrate the peritoneal cavity.

II. *Intra-cervical Fistulæ.*—According to A. Martin,[58] this variety is more frequent than is supposed, but it has a tendency to spontaneous recovery when not very large and when the ureter is not involved. As a first step, the orifice must be exposed by dilatation of the cervix with the laminaria tent. If the opening is small and the fistulous tract of considerable length, we may try cauterization with the red point of a thermo-cautery (or, better yet, a galvano-cautery) repeated several times at intervals of eight days. Many other caustics have been tried, among others the nitrate of silver. Neugebauer[59] has obtained by cauterization 15 recoveries in 133 cases, but he has also had one death from this method of treatment. If the

cauterizations fail, we shall have to have recourse to one of the two following operations for closing the fistula:

1. Denudation and suture.

2. Cystoplasty by dissection of the anterior portion of the cervix and suture according to Follet's method.

Denudation and suture were first successfully practised by Jobert of Lamballe (1849) in a case which was for a long time unique. Simon has done but one such operation. Several successful cases have been reported by Emmet,[60] Kaltenbach, Lossen, Martin, Müller,[61] Schröder,[62]

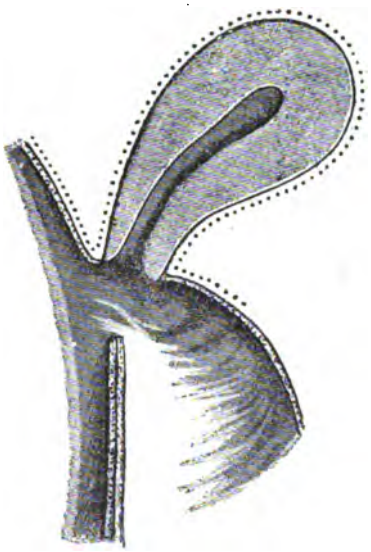


FIG. 94.—DEEP JUXTA-CERVICAL FISTULA. The posterior lip of the cervix and the posterior cul-de-sac are, as a result of retroversion of the uterus, situated upon a prolongation of the vesico-vaginal wall.

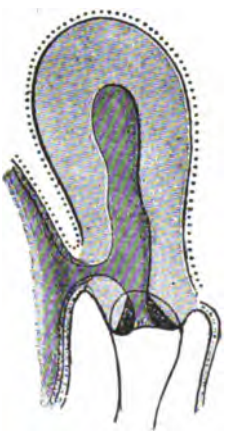


FIG. 95.—INTRA-CERVICAL FISTULA; HYSTERO-STOMATOCLEISIS. (Diagrammatic.)

Neugebauer,[63] Zweifel,[64] and Sänger.[65] The last has resorted to an ingenious procedure, a veritable trachelo-syringorrhaphy analogous to Emmet's operation. The fistula opened laterally. He commenced by splitting the two lips of the cervix; then he sutured the side on which the fistula was located as in Emmet's operation; then, in order to establish an adequate cervical opening on the mucous lining of the cervix to the external mucosa, he sutured the other side.

When the fistula is very high and in the median line, access is difficult. Follet,[66] Wölfler,[67] and Champneys[68] have practised cystoplasty successfully with direct suture of the vesical perforation exposed by a preliminary operation. Follet first dilates the urethra so

as to introduce the finger; the cervix is then brought to the vulva, the anterior cul-de-sac of the vagina incised, and the bladder dissected away in the neighborhood of the perforation. This is then united by sutures, with the aid of the finger in the urethra. This bold procedure was inspired by Jobert's cystoplasty by locomotion; it is associated with danger of penetrating the peritoneum, but this cannot under good antisepsis be considered a serious drawback.

As a last resort we have hysterocleisis, better named hysterostomatocleisis or suture of the two lips of the cervix (Fig. 95). The menstrual discharge then passes into the bladder, and uterine colic may result where the opening is small. Courty has, however, seen a number of cases in which menstruation was performed without

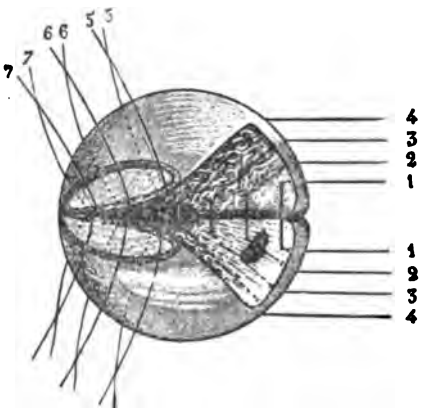


FIG. 96.—OPERATION FOR INTRA-CERVICAL URINARY FISTULA; SÆNGER'S METHOD.

inconvenience. The patient should be told that the operation entails sterility, although the existence of an orifice so small that only a small probe can be introduced has sufficed for impregnation, as in a case reported by P. Deroubaix.

URETERO-VAGINAL AND URETERO-CERVICAL FISTULÆ.—For a long time the obliteration of this variety of fistula was regarded as beyond the resources of art; but at the present time we have several operations applicable to the uretero-vaginal fistula.

1. *Method of Direct Obliteration.—Simon's*[69] *Method.*—As a first step, an artificial vesico-vaginal fistula is produced, by the side of the ureteral fistula. The sound is then passed into the ureter through this opening, and the ureter is opened up for the distance of about three-fifths of an inch of its intraparietal portion. The borders of this incision are prevented from reunion by the daily use of the sound.

When permanent cicatrization has been secured, the vesico-vaginal fistula, which is now some distance from the extensive denudation and transverse ureteral opening, is closed by sutures.

Landau's[70] *Operation.*—Landau also creates a vesico-vaginal fistula where one does not already exist, by an oval excision. He then passes a small elastic catheter into the ureter, securing it by passing its opposite extremity into the bladder through the urethra. Placing the patient in the genu-pectoral position, he then denudes the vaginal mucous membrane around the fistula. In closing the wound he passes his sutures in a direction parallel with the catheter, which is left in place for several days. Bandl[71] also has adopted a modified form of this operation in two cases. He obtained recovery after sev-

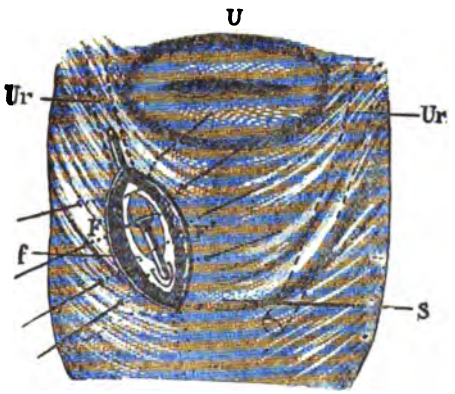


FIG. 97.—LANDAU'S OPERATION FOR URETERO-VAGINAL FISTULA. U, cervix; Ur, course of the ureter; S, fold of vagina corresponding to the inter-ureteric ligament; F*f*, Vesico-vaginal fenestra through which may be seen the sound passing into the ureter.

eral attempts, but not without having, in one case, to replace his sutures, which penetrated the ureter.

Schede's Operation.—Schede[72] has performed the buttonhole operation, removing about four-fifths of an inch of the vesical mucous membrane, in the direction of the affected ureter. The ureteral fistula was found under a fold of mucous membrane at the bottom of a cicatricial depression in the neighborhood of an old fissure of the cervix. He sutured the vesical and the vaginal mucous membranes about the line of the excision, so as to prevent its reclosure; a catheter was then introduced through the artificial opening into the ureter, its opposite extremity being carried into the bladder and out through the urethra. After this, an annular denudation is done about the fistula, leaving intact in its immediate neighborhood a zone of mucous membrane of about three or four millimetres diameter. As a result,

after suturing, the edges of the fistula, covered with intact mucous membrane, were turned into the bladder, forming a gutter-like depression, at the extremity of which the ureter opened. Recovery followed after a series of complications.

There is another procedure analogous to denudation which has been resorted to twice by Professor Trélat[73] without catheterization of the ureter. It seems to me also that the preliminary formation of a vesical fenestra and the introduction of the ureteral sound is not as essential in this case as in Landau's operation.

Operation by Splitting.[74]—In a case of uretero-vaginal fistula where the patient had been operated upon already eleven times by the ordinary procedure, I was able to establish the diagnosis by

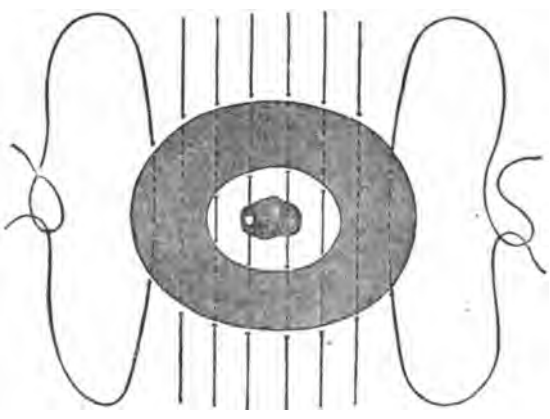


FIG. 98.—SCHEDE'S OPERATION FOR URETERO-VAGINAL FISTULA. (Schematically drawn.)

FIG. 99.—OPERATION BY SPLITTING FOR URETERO-VAGINAL FISTULA.

introducing Pawlik's ureteral sound to the depth of twenty-one centimetres. The vesico-uretero-vaginal orifice was small, so that it would barely admit the hysterometer. I performed the operation of division recommended by Gerdy and applied by Blasius, Dubouć, Collis, von Herff, Walcher, and others to the ordinary vesico-vaginal fistulæ. I believe that it served here a special purpose by allowing the replacement of the ureteral orifice in the bladder without danger of inclusion in the sutures. I proceeded in the following manner: Placing the patient in the genu-pectoral position, I made a transverse incision in the neighborhood of the fistula, carrying it about three-tenths of an inch beyond the fistula upon each side. I then made a vertical incision at each extremity, so as to give to the whole the form of the letter H (lying sidewise ⊥), and dissected up the margins of the transverse

incision for a distance of three-tenths of an inch, so as to obtain two small flaps from the septum. When the flaps were raised, the small orifice of the fistula was seen at the centre of the bleeding surface. On applying the one flap to the other above this opening, they came together without the least effort. They were carefully united by three deep silver-wire sutures and three superficial sutures. After suturing, the location of the fistula was marked by a small depression. The sutures were removed on the eighth day. Recovery was complete. This method has the advantage of extreme simplicity. In cases where the fistula is very large and the duplication very important we can bring the flaps together by the aid of pierced shot compressed over the wire.

Hergott, of Nancy,[75] without completely adopting this operation, has followed its main feature in dissecting out the ureter for the extent of three-tenths of an inch and turning it into the bladder. The ureter opened on one of the lips of the fistula, and was of a size which admitted a small bougie. In the case of a large uretero-vaginal fistula where you can obtain the exact position of the ureter, it is as well to limit the operation to this division of a single lip of the orifice. It frequently happens, however, as in my case, that at the time of the operation the orifice cannot be detected, so that it will be necessary to carry the division over the whole circumference of the fistula.[76]

2. *Method of Indirect Obliteration.*—This operation has been applied to uretero-vaginal fistulæ when direct denudation has failed. It is the only method which can be applied to uretero-cervical or uretero-uterine fistulæ. It consists in either the obliteration of the genital canal below the fistula or the extirpation of the kidney to which the perforated ureter belongs. The first plan would possess the fewest objectionable features were it possible to perform hystero-stomatocleisis or obliteration of the vaginal portion of the cervix; but this occlusion, to be free from danger, would have to be lateral and not terminal. Now, we know that, on the contrary, the portion of the canal between the fistula and the bladder will tend to contract and to become obliterated.[77] Theoretically, we might attempt the production of an artificial vesico-cervical fistula, which would permit the evacuation of the urine accumulated in the uterus, or we might establish an artificial ureter in the place of the segment obliterated. Both of these attempts have been made by Zweifel without success. We must therefore renounce hysterocleisis, and substituted obliteration of the vagina, or colpocleisis, after the establishment of an artificial opening be-

tween this canal and the bladder. This is the plan which has been followed, too, by Hahn.[78] He carefully united the mucous membranes of the superior lip of the artificial opening and sutured the inferior lip to the posterior vaginal wall in order to assure permanency of the vesico-vaginal outlet. The patient's husband subsequently desired the reopening of the vagina, and the artificial vesico-vaginal fistula persisted, while the ureteral opening had spontaneously closed. Kehrer[79] has recently published an interesting observation: he very justly remarks that a mere incision is not sufficient to assure permanency of the opening between the vagina and bladder, but that it is necessary to excise a portion of the septum, a disk about four-fifths of an inch in diameter, and then carefully unite the mucosa of the bladder and vagina.

Obliteration of the vagina is consented to by women with reluctance and it frequently happens that after the operation they demand a reversion to the condition of their former infirmity. It is apparent that nephrectomy may be preferred in spite of the dangers of removing one kidney where the patient may already have a certain degree of unrecognized bilateral ascending nephritis. This operation was first proposed by Simon. It was done by Zweifel[80] in 1878, and then by Credé;[81] so that in 1889 at least eleven cases had been operated upon, including that of Treub.[82] Before determining upon the operation, it is very important to assure yourself of the condition of the other kidney. The urine should be taken from this kidney directly by catheterization of its canal, and examined chemically and microscopically.

Gravity of the Operation; Operative Accidents; Results.—I shall consider here only the direct operation for the ordinary urethro- and vesico-vaginal fistula. These operations can be considered absolutely benign, although it adds a little to the gravity if the fistula is near the cervix, and consequently near the uterine arteries, ureter, and peritoneum.

Verneuil[83] has published the proportion of cases in his practice in which operation has been followed by death. The number was 5 out of 80. We must call attention to the fact that the most of these cases antedated the period of antisepsis;[84] the percentage is at the present day much smaller. Hegar and Kaltenbach have lost but a single case in a series of 80.

Wounding of the posterior wall by the brutally forcible use of the speculum deserves mention only because it has once been observed by

Courty;[85] it is easy to see that peritonitis might follow such a procedure.

Fatal primary hemorrhage can result only in the most unfavorable circumstances, in the case of hæmophilia for instance. Horteloup[86] has reported a case from the wounding of an extraordinarily developed uterine artery. This is, however, exceptional, although in any case hemorrhage may be serious during the operation, either in the case of denudation of the lateral vaginal wall, where the veins are largely developed, or if the operation is done at a time when the slough has not yet separated, or finally if the vesical mucous membrane is invaded. Direct compression followed by suture are the best measures for its arrest. It constitutes, however, one of the conditions unfavorable for primary union.

Secondary hemorrhage takes place from the third to the fifth day. I consider it always due to some operative defect. The remedy is the tampon. If the hemorrhage is into the bladder, it might pass unperceived at first, and the cavity become distended with clots before it can be controlled. Fragments will be discharged by the urethra with distressing tenesmus, and the decomposition of the residue will be fatal to the success of the suture. We should aid their expulsion by frequent vesical irrigation, and, if the distention of the bladder is considerable, should not hesitate to dilate the urethra and to break up the clots with a blunt curette. Lastly, if the hemorrhage continue, it will be necessary to remove the sutures and search for the bleeding vessel *per vaginam.*

Wounding or inclusion of the ureter is evidenced by lumbar pains, vomiting, and fever. In this case we should hasten to remove the suspected suture, as the complication may be very grave. The suture may cut through the ureter, however, causing a sudden explosion of uræmic symptoms.

The infectious complications—phlebitis, pyæmia, lymphangitis, and diphtheria—formerly rare, are now quite the exception. Peritonitis may result from wounding of the peritoneum during denudation or by the sutures in the absence of antiseptic precautions, or where a concomitant pyelitis or cystitis produces subsequent infection of the wound.

Calculi or calcareous incrustations have formed in the bladder in the neighborhood of silver-wire or silk sutures which have cut through the tissues and fallen into the bladder. It should not be forgotten that, in the majority of patients suffering from fistula, the urine is

altered by sympathetic inflammation of the bladder, which may have extended to the pelvis or even to the substance of the kidney itself. These conditions favor the formation of calculi. As these are, however, always phosphatic and very friable, they are easily broken up and removed by the lithotrite.

The results of surgical interference are altogether remarkably satisfactory. It can be said that no case is absolutely incurable by either the direct or indirect method. It is true that this last procedure substitutes a deformity for an infirmity, or necessitates the sacrifice of one of the kidneys. Many failures are due to an imperfect diagnosis. I operated upon one woman upon whom eleven unsuccessful attempts had been made to obliterate a small fistula in the anterior vaginal wall. I satisfied myself that these failures were due to the fact that the ureter had opened into the fistula, and I then performed the flap-splitting operation by which the ureteral orifice was turned into the bladder; recovery was immediate.

Incontinence of urine often persists for a long time after complete union of the fistula, so that the patient continues to lose urine involuntarily, and does not believe in her recovery. A number of anatomical conditions will explain this result. Loss of tonicity in the vesical sphincter and of the muscular coat of the urethra from disuse may be mentioned, as this factor plays an important rôle in the normal retention of urine in the female.

Several lines of medical treatment have been followed to remedy this condition—injections of strychnine, the hot douche, electricity, etc. Schatz has recourse to a special pessary. All pessaries, and in particular that of Dumontpallier, may diminish the incontinence by light pressure upon the urethra. Undeniable success has been obtained by means of a small plastic operation for the purpose of bridging the urethra and partly effacing its calibre. The urine then accumulates until present in sufficient quantity to overcome the obstacle. Schröder [87] practised two lateral denudations with the object of elongating and displacing the canal of the urethra. Pawlik [88] removed two lateral cuneiform fragments in order to produce lateral traction upon the urethra, and bend it so as to diminish the patency of the canal. His method is as follows: Seizing the urethra with a tenaculum, he displaces it as far as possible to either side, marking the points which correspond to this displacement (Fig. 100). Having outlined his denudation he proceeds to make two parallel incisions between the points. The orifice is then drawn with a hook toward the clitoris,

and the point marked to which it can be displaced. The incision is then carried forward, taking care to give it a slightly concave shape interiorly, so that after the suture the external urethral orifice shall not be too constricted. Having completed the outline, denudation is done and tissue removed at the side of the urethra so as to give a somewhat deep wound; the sutures are then placed drawing the urethra toward the clitoris, the sutures being directed obliquely as they approach the urethral orifice, and at the posterior portion being

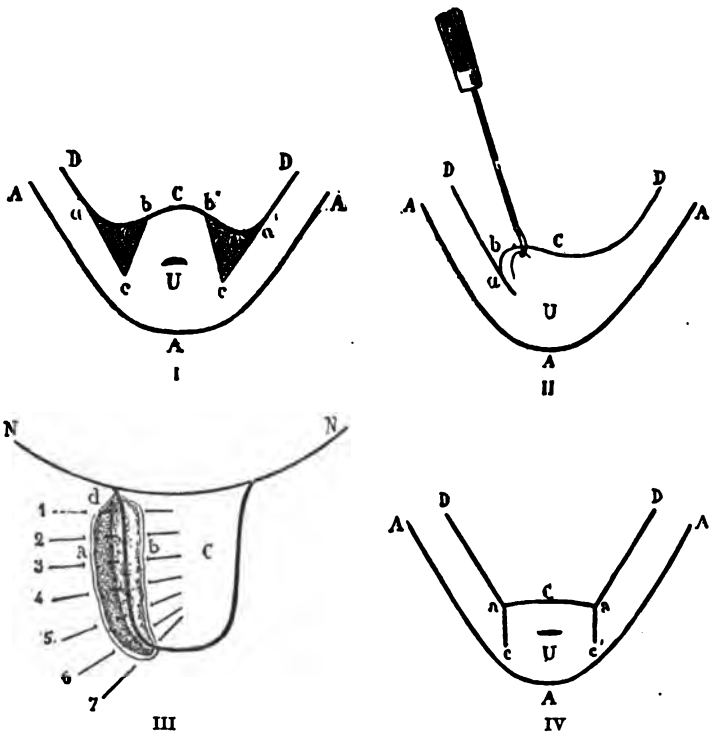


FIG. 100.—PAWLIK'S OPERATION FOR DIMINISHING THE CALIBRE OF THE URETHRA. I., Urethral region as seen when the patient is in the genu-pectoral position; II., extent of the denudation to be made, estimated by traction with a hook; III., denudation; IV., result obtained. A, Pubic arch; C, projection of urethral canal; D, posterior depression of the pubis; U, meatus urinarius; *a*, *b*, *c*, *a'*, *b'*, *c'*, outlines of the juxta-urethral denudation.

inserted antero-posteriorly. Pawlik operates in the genu-pectoral position, and uses carbolized silk, powdering the line of his sutures with iodoform. He does the second operation upon the other side after cicatrization of the first, and recommends frequent emptying of the bladder. He has obtained several good results by this method.

FECAL FISTULÆ.—I include under this common title both recto- and entero-vaginal fistulæ.

Recto-vaginal Fistula: Etiology.—Delivery is the most frequent cause. Compression is not, however, the determining cause, as in the case of urinary fistula. Recto-vaginal fistulæ are a more immediate result of traumatism; they ordinarily depend upon an extensive rupture of the perineum cicatrized inferiorly in the location of greatest depth, but leaving a perforation above where the thinness of the septum permits the two mucous membranes to come into contact and to unite in such a manner as to insure its permanency.

Among the rarer causes are: Wounds of the vagina by the forceps or cephalotribe, gangrene of the septum due to prolonged retention of the head, and direct traumatism by a foreign body violently introduced or retained for a sufficient length of time to produce ulceration. Finally, ulceration due to various other causes, such as abscess affecting either the vagina or rectum so as to produce an abnormal communication between them. These perforations are sometimes above the sphincter.[89] Dermoid cysts and the cysts of extra-uterine pregnancy if situated in Douglas' cul-de-sac and invaded by suppuration may produce an opening between the vagina and rectum by evacuating into both simultaneously. These fistulous tracts are not, however, counted in the class of fistulæ proper, previous to the cicatrization of their margins.

Pathological Anatomy.—I shall here consider only those fistulæ which can be called cicatricial, excluding such abnormal recent communications as are due to fresh wounds, or such as are of cancerous origin, where the fistula is but a phenomenon consecutive to a pathological process; also purulent fistulæ in the stage of evolution.

Verneuil classifies fistula from the standpoint of location, as: Recto-vulvar, the orifice being on the vulva or fourchette; inferior recto-vaginal, the orifice being in the lower part of this canal; and finally, superior recto-vaginal, in which the fistula opens in the vicinity of the cervix in the posterior cul-de-sac. These are rare and usually consecutive to the evacuation of an old collection in Douglas' cul-de-sac.

The dimensions are variable. Recto-vulvar fistula commonly consist of but a small opening; the fistulæ of the inferior part of the vagina also are often very narrow, the septum being at times thinned at a certain point so that they are apparently merely punched through, and are frankly ostial or labiform or in other cases canaliculated, having an oblique direction in the substance of the wall, their vaginal orifice being at times concealed by a kind of valve formed by the posterior vaginal border which is more or less irregular and

serrated. Fistulæ opening in the posterior cul-de-sac may have very large dimensions, being often consecutive to a large slough caused by the pressure of a tumor which subsequently opened into the two canals. I have observed one in a case of fœtal cyst which would admit the thumb. When the fistula consists of a canal, it is the vaginal mucous membrane which is reflected and lines it.

The margins of the fistula are ordinarily hard, and sharply defined. Cicatricial bands may also divide the vagina connecting these with vesico-vaginal fistula due to the same difficult labor.

Symptoms and Diagnosis.—The passage of gas and fecal matters is the pathognomonic sign for the clinician, and the most distressing symptom for the patient. The discharge of these matters is not, however, absolutely constant, and may fail altogether if the direction of the fistula be oblique and the stools solid. With diarrhœa, however, it is always present. An intense vaginitis develops where the phenomenon is constant. With the finger one is able to demonstrate a recto-vaginal fistula if it have any size; while the speculum, aided by the sound and the rectal touch, is always sufficient for its discovery. Sims' position is the most convenient for this examination. If necessary, an enema of milk may be made to filter through the orifice, where it is situated behind a fold or hidden in a cicatrix.

Prognosis.—We have here a condition which is not very amenable to treatment, even when it is of apparently slight importance; for the difficulties in the way of recovery do not depend upon the extent of the lesion. The most difficult cases are those complicated with multiple cicatrices in the vagina.

Cases of spontaneous recovery have been reported. In such cases there has been an error in diagnosis, the pretended fistula being merely a granulating wound. A perforation with cicatrized margins does not recover by the efforts of nature, or, better expressed perhaps, it is itself an example of imperfect but complete spontaneous recovery.

Treatment.—Cauterization may be tried in the case of very small fistulæ, especially if the canal is of considerable length, and obliquely situated in the substance of the recto-vaginal wall. Nitrate of silver or the thermo-cautery may accomplish obliteration of openings left by previous sutures. The great mobility of the septum favors concentric retraction of the margin of the fistula. Verneuil [90] proposes immediate secondary union, as in the Italian procedure (Amabile) for vesico-vaginal fistula.

For perforations of considerable size, recourse must be had to denu-

dation and suture. The obstacles to the success of the operation are here much greater than in the case of the urinary fistula. The principal danger is that of infection of the wound with gas and the contents of the rectum. It is only by a very large and very exactly apposed surface that success can be obtained.

Operation may be attempted from three directions—the vagina, the rectum, and the perineum.

1. *Operation by the Vagina.*—This is the usual procedure, especially in fistulæ not complicated by cicatrices which deprive the vagina of distensibility. As a rule, it is easiest to attack the fistula from this direction, the vulva being more distensible than the anus, behind which the coccyx is an obstacle. The mucous membrane of the vagina is also firmer, it stands the denudation better, and bleeds less; the suture is also less exposed to infection.

Purgatives and baths should be given as preparatory treatment preliminary to the operation; the patient placed upon a low diet, and thorough antisepsis of the vagina and rectum attended to. To these should be added intestinal antisepsis by the administration of naphthol and the salicylate of bismuth.

The patient is placed in the dorso-sacral position, the vagina is exposed by a flattened speculum superiorly and lateral retractors. The margins of the fisula are seized and fixed by the forceps. The recto-vaginal septum may be elevated by the finger of an assistant or by a rectal tampon of iodoform gauze. It is better that the surgeon should not insert his fingers into the rectum at all, on account of the danger of infection.

Denudation should be carried to a considerable depth, and the lining of the canal should be dissected out up to the rectal orifice. On passing the sutures, these should exclude the rectal mucous membrane underlying the whole extent of the wound, which has the form of a funnel. Afterward, superficial sutures should be inserted, taking up only the vaginal mucous membrane and alternating with the preceding. It is better to use silver-wire sutures than silk, as these are more easily kept aseptic. Finally, the extremities of the sutures should be massed and wound about a rubber tube. The line of suture is placed in the direction which presents the least tension. In the case of a large perforation, this is generally transverse. In special cases it is necessary to resort to liberating incisions or even to autoplasty with flaps obtained by splitting the septum. Finally, if the perforation is very large and in the immediate vicinity of the cervix, we may have to follow the

example of Simon—denude the anterior cervical lip and unite it with the inferior lip of the fistula. The menstrual blood will now be discharged into the rectum.

2. *Operation by Rectum.*—Fistulæ located in the upper part of the vagina sometimes resist all efforts toward obliteration by this passage (Simon). In some cases, too, the recto-vaginal fistula coexists with a vesico-vaginal, and the incision of the cicatricial masses necessary to expose the rectal perforation may result in incontinence of urine by allowing relaxation of the vaginal walls. It will be better in these cases to attack the fistula from the rectum.

The woman is placed in the genu-pectoral or in the Sims position. As a preliminary measure, forced dilatation of the sphincter ani must be practised. Having overcome its resistance, the rectal cavity is exposed with a short speculum and retractors, and the borders of the fistula are seized and immobilized by the forceps and tenacula. Continuous irrigation is of service in removing the blood during denudation. The operation is aided by the finger in the vagina. The suturing is to be done in a special manner. We follow Simon's example, inserting the needle in the immediate vicinity of the rectal wound, directing it in such a way that it will emerge into the vagina one-fifth of an inch beyond the margins of the perforation. Sometimes it will be easier to place the suture per vaginum by an inverse order of procedure. Care must be taken to avoid the inclusion of the rectal mucous membrane in the wound, where it has a tendency to insinuate itself. We should employ silver wire and rubber tubing, as in the case of the vaginal suture. The extremities of the wires are placed in the rectum and covered by a strip of iodoform gauze, which projects through the anus.

Operation by the Perineum.—The fact of the existence of this operative procedure is an index of the great difficulty encountered in obliteration of the recto-vaginal fistula by what might be called the more direct means of access. Saucerotte[91] first did this operation, in 1798; the procedure did not, however, become general. Isolated cases of section of the perineum, with or without immediate perineorrhaphy have been performed by Ricord,[92] Dumarquay,[93] Baker Brown;[94] Richet[95] practised the operation first in France, and Simon[96] in Germany. More recently the method has had many advocates.[97]

It is necessary to distinguish two varieties of cases—those in which the perineum is intact, and those in which it is ruptured or imperfectly cicatrized.

Where the perineum is intact, its firmness and resistance may make it difficult to reach the fistula from the vagina; it will be hidden, so to speak, by the projection of the perineum, denudation and suture of the abnormal opening cannot be accomplished properly, and the operation will fail. It certainly seems a very radical procedure to deliberately cut through any extent of healthy tissue; nevertheless it is often the only thing to be done to secure reunion. The fistulous tract should be dissected out carefully, all the cicatricial tissue removed, and the parts immediately sutured by one of the operations to be later described (see chapter on Rupture of the Perineum).

Some surgeons have proposed to limit this operation to vertical section of the perineum, and to confide the work of cicatrization to nature, or to perform a later supplementary operation. It is evident that this method is very inferior to complete repair at a single séance.

In the case of ruptured perineum, operation for recto-vaginal fistula is to be combined with denudation and suture for the rupture. Lawson Tait's method by flap-splitting merits to be first tried on account of its simplicity. We should here, as in the preceding case, excise the fistulous tract.

The dressing consists in the application of iodoform and antiseptic compresses renewed daily. It will be necessary to catheterize the patient during the first few days, in order to prevent the discharge of urine over the vulva and sutures.

After-treatment.—Is it necessary to constipate the patient? Several authorities maintain that it is, and give opium for from ten to twelve days after the operation, trusting that by this time the cicatrix will be strong enough to resist solid stools. Other surgeons, dreading the effect of this ordeal, prefer to administer laxatives. In this case, however, the liquid matters are apt to enter the line of the sutures and infect the wound. Hegar recommends the following, which seems to be a judicious plan. He thoroughly purges the patient before the operation, then puts her upon a rigid milk and broth diet during the first three days; on the evening of the fourth day he gives a small dose of calomel, and the following morning a glass of purgative mineral water; after the second stool he arrests further evacuations by a little opium. He repeats the treatment every forty-eight hours.

Metallic sutures are left in place for fifteen days if they do not cut through. They are always to be removed from the side where they are twisted and fixed. Where silk sutures are used, they become

infected at the end of eight days, and cannot be retained much longer without provoking inflammation.

ENTERO-VAGINAL FISTULÆ.[98]—We here include all communications between the vagina and the intestine, the rectum excepted. According to their size and the quantity of the matters to which they give passage, such a fistula may be called an abnormal vaginal anus or a stercoro-vaginal fistula. One of the first of the cases published was by MacKeever.[99] Others followed by Roux,[100] Casamayor,[101] Ashwell,[102] Breitzmann, Simon, Demarquay,[103] and others. L. H. Petit[104] has collected all the cases scattered through literature, and published them in an exhaustive monograph upon the subject.

Etiology.—In the great majority of cases the lesion originates in rupture of the posterior cul-de-sac during labor. An intestinal loop passes through the perforation, becomes adherent, and sloughs more or less completely either by the rapid process of strangulation or more slowly by ulceration. Direct traumatism may produce it, but this cause is excessively rare. The same is true of wounds made by the surgeon during operations, such as vaginal hysterectomy. Suppuration of a dermoid cyst or of the cyst of extra-uterine pregnancy opening into the vagina or intestine are exceptional causes. As to the perforations due to cancer, these do not belong to the list of permanent lesions, to which this study is limited.

Pathological Anatomy.—The posterior cul-de-sac is the almost exclusive location of this abnormal opening. Breitzmann[105] and Dahlmann[106] have, however, seen a fistulous opening in the anterior cul-de-sac. The lower part of the ileum is the portion of the intestine most often implicated; fistulæ of the sigmoid flexure are also observed. The aperture is apt to be very large where the entire intestinal loop sloughs, or it may be double, separated by a spur; this is, however, rare. At other times it consists merely of a small hole. Cicatricial bands are sometimes found in its vicinity, producing contraction of the vaginal canal. The cervix will be altered by metritis provoked by the constant infection of the vagina, which will be itself in an inflamed condition.

The lower segment of the intestine tends to atrophy and to become obliterated; in the case reported by Casamayor it had been transformed into a solid band. Sometimes we find coincident vesico-vaginal fistula.

If the fistula is completed by the intermediation of a cystic cavity, it may be called an ileo-cysto-vaginal fistula (Petit).

Symptoms.—Where the aperture is very large, the greater part, if

not the whole of the fecal matters may be passed into the vagina. In a word, there then exists a vaginal anus. The discharges appear about two hours after eating, and have the appearance of partially digested food mixed with bile, and the consistence of *purée*. The character of the stools and the time of their discharge are valuable indications of the site of the intestinal perforation. The vaginal opening can be detected by the touch or is easily discovered by exposure with the speculum and retractors, placing the patient successively in various positions.

Where the perforation is very small, sometimes several examinations may be necessary for its discovery.

Menstruation is often suppressed. This has been attributed to impairment of the general health. The patient often suffers from inanition due to imperfect absorption of food. MacKeever cites a case, however, in which the woman became pregnant.

A very small fistula may recover spontaneously under the influences of good hygiene and minute attention to cleanliness. If the perforation is large, the lesion is usually permanent and the patients die of exhaustion. Petit, however, cites two exceptional cases where, after the sloughing of a loop of the small intestine, recovery followed.

Diagnosis.—This depends first upon the existence of fecal matters in the vagina; when assured of the existence of an abnormal communication, it remains to determine its precise location. In searching for the aperture, the probe is carried into the folds of the mucous membrane. If not found, the cervix may be dilated and the examination extended.

The site of the intestinal perforation will be determined by the character of the matters discharged. Where the small intestine is implicated, these will be liquid, and of a greenish or yellowish hue; they will also present undigested food, such as the leguminous foods, which are not attacked by the digestive juices. The stools appear in from two to three hours after eating where the perforation is in the terminal part of the ileum. Where the discharge occurs earlier, the site of the perforation is supposed to be higher up. Where the discharge is later, of a more nearly solid consistency, and having a fecal aspect, the perforation may be in the sigmoid flexure.

We should examine with care into the condition of the orifice, guarding against the error of regarding the neighboring uterine cervix as a second fistulous tract. Where there are two openings separated by a spur, the upper one is the one which gives passage to the

discharges; the direction and the permeability of the two openings should be ascertained by careful probing with a flexible sound. If the vagina is too narrow to admit of this examination, injections of milk may be used or progressive dilatation in one or two séances with section of the cicatricial bands. Rectal touch assists the probe in determining the intestinal aperture, as it assures us at least of its location beyond the reach of the finger.

Treatment.—Where we have a very small fistula with only a slight discharge of fecal matters, and evidently implicating the intestine laterally, we may try cauterization with the thermo-cautery, as in the case of recto-vaginal fistulæ. After several ineffectual efforts, we can then resort to denudation and suture.

When the perforation is terminal and the whole of the matters are passed into the vagina, we have quite a different state of things. The operative plan here indicated is that which has been followed with success by O. Weber and C. von Heine.[107] It consists in the re-establishment of the digestive tube by section of the spur so as to transform the vaginal anus into a stercoral-vaginal fistula; then the obliteration of this by denudation and suture.

For section of the spur, these authorities used Dupuytren's enterotome. Verneuil recommends simple long catch forceps; in order to render the compression less forcible and the sloughing less rapid he advises covering the jaws of the forceps with rubber tubing and then increasing the compression gradually from day to day by means of the ratchet catch on the handles.

In case we cannot obtain a result by this method, we are, I believe, justified in performing laparatomy in order to detach the two adherent portions of intestine from the vaginal cul-de-sac, suture the latter, then vivify and unite the two segments of intestine. This operation is the only rational procedure for an entero-uterine fistula. If the inferior segment is obliterated or much contracted, the superior segment may be united to the most accessible portion of the large intestine; the advances of abdominal surgery at the present day having made practical this procedure, which when inagurated by Roux[108] was considered a rather venturesome operation.

The procedure conceived by Jobert is fraught with quite as much danger; it consists in detaching the superior segment, and inserting it through an opening in the recto-vaginal septum, thus bringing it into the rectum.

Colpocleisis or obliteration of the vagina below the fistula, after

having created a large communicating opening between the vagina and rectum, was suggested to Simon by his analogous operation for the cure of vesico-vaginal fistula. This can only be serviceable after previous obliteration of the uterus by hystero-stomatocleisis.

Casamayor's[109] operation is preferable. It consists in the production of a passage for the transmission of matters into the rectum, below the vaginal fistula. To obtain this result he introduces one of the blades of a long curved forceps into the intestine through the fistula, the other blade he introduces into the rectum, he then brings the two together and after assuring himself that nothing is included between them but the walls to be divided, they are closed. A slough is the result, and after its separation the fecal matter passes directly into the rectum. In one case, however, the discharge by the vagina continued and the patient succumbed a month later.

Verneuil[110] has proposed a modification of Casamayor's operation, which is as follows: 1st, by the help of a curved trocar, he perforates the recto-vaginal wall about one-fifth of an inch below the fistula, and passes a rubber tube through the opening made; 2d, in the same way he perforates the ileo-rectal wall about one inch above the first puncture, passing through it a second rubber tube; 3d, he unites the two rectal ends; this forms a loop whose two ends pass out through the vagina, one by means of an artificial anus, the other below it, leaving between them the portion of wall which is to be divided. The rubber tubes are now tightened, and cut through the tissue.

Verneuil has not yet had occasion to put his ingenious method into practice. We therefore do not know whether the establishment of a rectal opening is sufficient to induce obliteration of the vaginal perforation.

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2. Morand and Jobert (de Lamballe) have reported instances of it.

3. L. Tait has observed four such cases (cited by Schröder: Mal. des Org. Gén. de la Femme, French transl., 1886, p. 519). Schröder (ibidem) has noted a case of perforation produced under his immediate observation.

4. Verneuil: Mémoires de Chir., vol. i., p. 933.

5. Hegar and Kaltenbach (Traité de Gyn. opér., French ed., p. 498) state that but nine such cases have been published. Bérard was the first author who put a case on record.

6. Deroubaix: Traité des Fistules Uro-génitales de la Femme.

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10. Kroner: Arch. f. Gyn., Bd. xix., p. 149.

11. Nélaton: Pathologie Chirurgicale, vol. v., p. 485.

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20. Velpeau: Nouveaux Éléments de Médecine Opératoire, vol. iv., p. 440.

21. Laugier: Nouvel Instrument pour la Réunion des Fistules Vésico-vaginales. Journal Hebdomadaire, 1829, vol. v., p. 420. This instrument is described and illustrated by Sédillot and Legouest: Loc. cit., vol. ii., p. 552, fig. 562.

22. Jobert (de Lamballe): Mémoire lu à l'Académie des Sciences, February 4th, 1836 (Gazette Médicale, 1836, vol. iv., p. 225) and report by Blandin: Bull. Acad. de Médecine, March 27th, 1838, vol. ii., p. 581; Traité de Chirurgie Plastique, Paris, 1849, vol. ii., p. 409; Traité des Fistules Vésico-utérines, Vésico-utéro-vaginales, etc., Paris, 1852.

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CHAPTER XVI.

VAGINISMUS.

Definition, Classification.—Vaginismus or vaginodynia (Simpson), spasmus vaginæ (Kiwisch), consists in an abnormal hyperæsthesia of the external genital organs which may induce spasmodic contraction of the constrictor (sphincter) of the vagina and of the other muscles of the pelvic floor. There are three distinct classes of the malady, or, better, three particular types.

1st. Hyperæsthesia with contraction.

2d. Hyperæsthesia without contraction.

3d. Contraction without hyperæsthesia.

The first of these three is by far the most frequent, and the last the most rare.

An attempt has been made to base the classification on the seat of the malady, and to distinguish inferior vaginismus from spasm of the sphincter vaginæ, and superior vaginismus from spasm of the most interior and the most inferior of the fibres of the levator ani (Hildebrandt[1]). I do not think that this distinction should be preserved clinically, for contraction of the lower part of the vagina is very unusual. As to essential or idiopathic vaginismus, it probably does not exist; only the point of origin of the reflex may remain unknown.

Historical Review.—Though Marion Sims drew the most complete clinical picture of vaginismus and gave it the name which it still bears,[2] it would be unjust to give him the entire credit for its recognition.[3] In 1834 Huguier[4] devoted many pages to the study of spasmodic action of the sphincter vaginæ and established an analogy between it and similar conditions of the anus. Certain valuable notes on the affection are scattered through the writings of many authors —Dupuytren,[5] Lisfranc,[6] Hervez de Chégoin,[7] Scanzoni,[8] Kiwisch,[9] and Simpson.[10] All of these writers have described hyperæsthesia of the vulva and spasmodic contraction of the vaginal sphincter, but their vague ideas have now no precise nosological value.

Since Sims' description, many papers have appeared, relating to

both the etiology and the treatment of the affection; among which I will particularly mention those of Debout and Michon,[11] Charrier,[12] Scanzoni,[13] Visca,[14] Putegnat,[15] Lutaud,[16] Trélat,[17] Daude,[18] Gallard,[19] Budin,[20] Verneuil,[21] Leroux,[22] etc.

Etiology, Pathogeny.—Two conditions are necessary for the production of vaginismus: (1) great nervous excitability, and (2) some irritation of the external genitals which serves as a starting-point for the exaggerated reflexes on the part of the sensory and motor nerves, thus producing hyperæsthesia and contraction. The majority of women affected with vaginismus are young, nervous, and at times hysterical, but it is false to conclude that hysteria is a necessary condition without which vaginismus cannot exist.[23] The irritation of the external genitals has its origin for the most part in the beginning of the conjugal relation and the first attempts at intercourse. Schröder has described a peculiar condition of the vulva in certain women, where it is placed far toward the front of the symphysis, so that the urethra and the navicular fossæ are directly presented to the penis and are hence compressed against the bone during the first efforts of coitus. In some cases the urethra becomes dilated, and its orifice so enlarged that an imperfect copulation becomes possible through it. Excoriation results, and the hyperæsthesia becomes so acute that the lightest contact is excessively painful.

There are other women where the hymen, though normal, is particularly rigid; and others where its orifice is large enough for the introduction of the penis without laceration. In any of these cases where there is a pushing back or dilatation of the membrane it thickens, inflames, and becomes very sensitive. Loss of erection in the male or premature ejaculation may be causes of vaginismus, for they also interfere with the destruction of the hymen.

Vaginismus in women after defloration may be due to inflammation of the caruncule myrtiformes from some irritation, and is also noticed where the vulva presents fissures.

Small polypoid tumors of the urethra or hernia of the urethral mucous membrane, irritated by coitus, produce the same effects. Fissure of the anus may at times cause a sphincteralgia of the vagina from irradiation of the pain and reflex contraction. It has also been asserted that an affection of the uterus, especially erosion of the cervix, might have the same result;[24] and cases of superior vaginismus from disease of the uterus and ovaries have been described.[25] I think that this is a veritable abuse of language, and that the name

vaginismus has often been wrongly attributed to the simple phenomena of pain without vulvar hyperæsthesia and to the movements of defence which result therefrom.

All the preceding factors relate to the usual type of vaginismus where the hyperæsthesia is accompanied by contraction. In other less common instances this latter symptom is lacking; this is observed especially in young virgins who have never attempted coitus, but where the suspicion of onanism is not wholly absent. Gosselin[26] has described cases where the hymen was very sensitive. E. Martin, Sr.,[27] attributes great importance to gonorrhœal infection transmitted to young women in their first intercourse.

Pathology.—As is usual where the nervous system is chiefly involved, the symptoms are wholly out of proportion to the lesions. In this respect, vaginismus resembles fissure *in ano*. Most often we find signs of inflammation about the vulva, the hymen, or its caruncles. There may be fissures, syphilitic or otherwise, of the anal and vulvar orifices, polypi or vascular tumors of the urethra. At times there is nothing to be found. The dilatation of the urethra which is occasionally present is the result of attempts at heterotopic coitus.

Symptoms.—In the ordinary type of the affection there is hyperæsthesia with contraction. The origin of the symptoms is most often at the moment of intercourse, which has been performed either in a brutal or on the contrary in a hesitating and clumsy manner. There are, however, many cases where the symptoms appear very late, after the woman has been married a long time. The pain is the principal symptom and has given to the affection the name of neuralgia, neurosis, or hyperæsthesia of the vulva. It is at times limited to exact points or zones which are relatively restricted to the internal surface of the labia minora, the fourchette, or to certain caruncles in the vicinity of the urethral orifice; in other cases the sensitive area comprises the whole of the vulvar surface.

There is no doubt that there exists a clinical type where there is hyperæsthesia without contraction, but such cases are rare. The sensitiveness of the parts may reach such a degree that the simple touch of a feather is insupportable; more often, however, the little finger may be introduced, and it appreciates that there is a spasmodic contraction provoked by the pain, but this is not always present. The spasms may involve the adjacent muscles; the anal sphincter especially may become so hard as to be taken for a tumor by the patient (Sims). Verneuil[28] admits that the contraction is not in the

sphincter vaginæ, whose fibres seem too scattered and feeble, but in the transverse perineal muscle and in the whole muscular mass of the perineum, and it may also extend to the urethra.[29] A sensation of weight and pain in the perineum renders the effort of walking difficult. The centre of the tetanic contraction is at the entrance of the vagina or a little above, but the levator ani may also be involved, and then the cramp extends deeply.

Coitus is impossible, and sterility is hence the rule, yet fecundation has been observed, the semen thrown upon the vulva making its way into the vagina by capillarity. The spasm may cease during pregnancy and reappear after delivery. Benecke[30] has reported a case where parturition was difficult because of the spasm; but labor usually produces the complete disappearance of all the morbid phenomena.

Neuralgic pains have been observed at many other points of the body. The general condition suffers by the continuance of the pain and the moral preoccupation, so that these patients rapidly become hypochondriac.[31]

Diagnosis.—Vaginismus should not be confounded with simple pain on intercourse, or dyspareunia (Barnes), which is a phenomenon of almost all diseases of the genital organs.

Imperforate hymen and atresia of the vagina are easily recognized on inspection, and they also coexist with absence or retention of the menses.

Simpson and Hildebrandt[32] have described under the name of "penis captivus" a contraction of the levator ani, which a woman occasionally has the power of producing voluntarily. It is only a physiological curiosity, and altogether different from vaginismus. When this contraction assumes the character of a pathological process, it has been called superior vaginismus. It is most often a contraction without hyperæsthesia, and has been ascribed, without proof, to opposition to fecundation.

Treatment.—The indications are to diminish the morbid hyperæsthesia and to destroy the lesions which are its immediate cause. The first care of the physician should be to remove every incentive of sexual excitement. Then an antispasmodic treatment may be begun, and here hydrotherapy and bromide of potassium render efficient service. With these may be joined the local application of cocaine, suppositories of opium and belladonna, etc. But the capital indication is to abolish the local affection which is the starting-point of the reflexes. Vulvitis should be treated with sitz baths, frequent appli-

cation of Goulard's lotion, boric-acid solution, borated or iodoformed vaselin, light cauterization in the fissures with nitrate of silver solution (1: 20), iodoform in powder, etc. Then any lesions of adjacent parts should be sought out and removed. If there is a fissure of the anus, the sphincter should be stretched; if there is a urethral polyp, it should be excised, etc.

The thickened and inflamed hymen, incompletely torn or reduced to only a trace of its original extent, is often the origin of the pains, although it is not the only one, as Simpson maintained in his first publications. Its excision will frequently produce a cure. This little operation is easily done with a pair of curved scissors after the application of cocaine, and a hem suture produces immediate reunion of the small wound. At the end of a few days progressive dilatation should be begun; the patient should take a sitz bath and introduce a series of bath specula of gradually increasing diameter. If attempts at intercourse remain painful after this, the vagina must be forcibly dilated under anæsthesia. We proceed as in the case of fissure of the anus; the middle and ring fingers of each hand are introduced into the vagina, and by pressure at different points the greatest possible distention of the orifice without tearing the skin is produced.

We are to-day less given to bloody operations in vaginismus than was at one time the case. We no longer practise section of the internal pudic nerve as proposed and performed by Simpson, and but few surgeons employ Sims' section of the vaginal sphincter. To perform this the patient is chloroformed and two fingers of the left hand are introduced into the vagina. Then with a bistoury the superficial fibres of the bulbo-cavernosus are divided on either side of the median line to a depth sufficient to relax their tension, the incision being carried from half an inch in the vagina to the border of the skin. After the section, Sims dilated the orifice strongly and tamponed it with cotton, which was changed to a large glass dilator on the following day; this was worn nearly continuously at first, and later left in place two hours at night and two hours during the day for many weeks until all danger of contraction had passed.

I will also mention the use of electricity, with which Lomer[88] claims to have obtained great success.

These patients are generally anæmic and need a tonic regimen. Great attention should be paid to the mental condition of certain women, especially where there is a tendency to lunacy by inheritance. Change of air and scene should be prescribed wherever possible.

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CHAPTER XVII.

LACERATION OF THE PERINEUM.

Etiology, Pathogeny.—The perineum is a resistant fibro-muscular floor which closes in the abdominal cavity below and supports the weight of the contained viscera. Viewed from within it has the appearance of a very wide funnel with attachments to the pelvic wall, pierced eccentrically at its anterior part by the orifice for the passage of the vagina. Viewed from without, it is reduced to the space comprised between the fourchette and the anus, forming the base of a triangular pyramid; its base answering to the skin and the intercrossing of the sphincter muscles of the anus, the constrictor vaginæ and the transversus perinei, while its apex is lost in the recto-vaginal septum. Along one of its sides runs the vagina, its lower portion re-enforced by the hymen or its vestiges, while the other side is tangent to the rectum. The lateral parts of this perineal prism have for their support the deep internal borders of the levator muscles of the anus attached to the side of the rectum, and forming by their intricate arrangement a support for the whole region.

At the time of parturition the vulva gives passage to a fœtus, whose diameters are in excess of the canal through which it passes. This could not happen were it not for two factors, the thickening and softening of the tissues caused by the marked venous congestion toward the end of pregnancy, and the elasticity of the muscular and cutaneous planes. When one of these elements is absent, the perineum either gives way or tears. This accident may be due to various circumstances: To exceptional rigidity of the tissues in a woman who becomes a mother at an advanced age, or who presents especial narrowness of the vulva; excessive volume of the fœtal head or a posterior position which has not been reduced; too rough passage of the head and shoulders; narrowness of the pubic arch; a too perpendicular position of the sacrum, which allows the head to be carried backward, as in the flat or rachitic pelvis; ill-applied forceps; too hasty version, etc. Traumatism of different forms may be the cause of perineal laceration, but this is not a common origin for the accident.

In parturition it is not the cutaneo-mucous investment of the vulvar commissure which forms the chief obstacle to distention of the part, but the fibres of the muscles which lie immediately beneath. These fibres, according to Olshausen, are the constrictor of the vulva; according to H. A. Kelly, they are the most internal portion of the levator ani at their insertion into the rectum; Budin[1] attaches less importance to the muscular fibres, and sees in the hymen the chief cause of rigidity of the vulva. The laceration of the hymen may play the rôle of a scissor cut in tearing cloth (Pajot), but it does not seem that the tear in the superficial soft parts can be the initial phenomenon; it is more likely, I think, to be subcutaneous rupture of the muscles. This deep rupture may be the only one if it permits the parts to dilate sufficiently, and, instead of a visible tear of the perineum, there is only that loss of power which plays so important a part in the production of genital prolapse.[2] When the fourchette is not elastic enough, even after the rupture of the muscular fibres below, it gives way in its turn, and the visible laceration is produced. This happens most often on the left side very near the median line, and varies in extent from a simple tear in the integument to a division of the anal orifice, reaching up to a high point on the recto-vaginal septum.

The mechanism of central ruptures, which are very rare, is similar: The head is badly directed, and passes backward to the middle of the perineum, which it distends and causes to tear; then after the delay of a few minutes which follows the momentary diminution of the distention, it reascends a little and then directs its passage toward the vulvar orifice, in passing through which it may cause another rupture of greater or less extent. At times the child may pass by the central opening, as in a case of Simpson's.[3]

Pathology.—The following description is applicable only to old and cicatricial lacerations.

The laceration is most often found at the fourchette and a little to the side of the median line, and is called incomplete when it does not involve the anal sphincter.

There are two degrees of incomplete laceration, in one of which the fourchette alone is torn, while in the other the tear is deeper and involves the muscular planes, without rupturing the sphincter ani. The vulva appears to be elongated posteriorly, and is wide open, and at the forchette there is a soft cicatricial surface. If the lesion is of long standing, there is almost always a slight degree of cystocele and uterine prolapse.

In the complete form the vulvar and anal orifices are thrown together so as to form a cloaca, about which there are prominent folds of mucous membrane. The recto-vaginal septum is rounded in a full curve, or like a pointed arch with doubly curved sides, and at its apex there is often a small triangular portion of red rectal mucosa, which hangs like a pendant. The posterior column of the vagina may

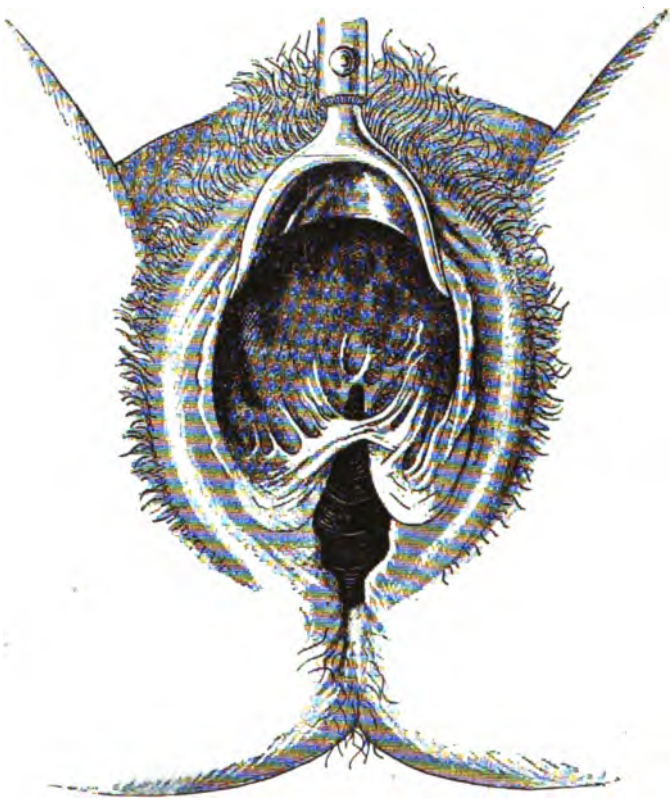


FIG. 101.—COMPLETE RUPTURE OF THE PERINEUM INVOLVING THE RECTO-VAGINAL SEPTUM.

be isolated by a double laceration which gives it the aspect of a uvula, but more commonly the laceration has passed to the left side of this projection. The cicatricial tissue deforms the parts in a varying manner, one of the borders of the opening being thick and the other thin, or a number of bridles may stretch across it (Fig. 101). The division of the tissues may reach up to the posterior cul-de-sac of the vagina.

At the lower edges of the laceration the parts are drawn upward

by the action of the levator ani, and on the sides there may be a small depression corresponding to the stump of the sphincter.

There are two degrees of complete rupture, according as the sphincter and the anal orifice alone are torn or the recto-vaginal septum is also divided (G. Thomas). This distinction is of value to the operator, for the repair of the septum requires a special modification of the surgical treatment.

It is usual to find deep ruptures of the cervix with complicating metritis accompany those of the perineum, and Thomas claims that the vagina also remains in a condition of subinvolution.[4] Cystocele and uterine prolapse are often observed in this condition.

Diagnosis.—Examination by touch and speculum reveals the deformities which I have described. To practise this exploration, the patient should be placed first in the dorso-sacral and then, if necessary, in the genu-pectoral position, and the region displayed by means of a large anterior blade and lateral separators.

Symptoms.—The rational signs vary according to the extent of the laceration. In the incomplete form all the symptoms are attributable to the gaping of the vulva, which favors the formation of cystocele, uterine prolapse, and also metritis. It is not uncommon to see these patients suffer from great difficulty in walking, and vague pains which are due to the enteroptosis, and are to be referred to the disturbance of the uterine equilibrium from loss of the perineal support.

In complete laceration there is incontinence of gas and liquid fæces, even when the solid portions of the intestinal contents are well retained. Certain patients, however, are able to retain the gas when they are in the horizontal position,[5] even when the entire sphincter has been ruptured.

Prognosis.—This lesion is a serious one, although the patient may not suffer from destruction of the sphincter, for it renders her incapable of exertion, easily fatigued, and predisposed to prolapse of vagina and uterus, and the development of metritis.

Treatment. Recent Lacerations of the Perineum.—Should the repair of the injury be left to nature, which is capable of accomplishing it in many circumstances; or should we aid and direct this healing process, which is often defective or insufficient, by immediate suture? This matter has been much disputed, especially during the time when ignorance of the benefits of antisepsis and asepsis rendered success very doubtful. In certain cases it is better not to inter-

fere; for instance, if the patient is very much exhausted and one lacks the necessary assistants, etc.; but such contra-indications do not concern the operation itself. Every lesion should be repaired at once, wherever it is possible. Cures have been obtained in this way, even when the tissues appeared to be much contused and ill adapted for primary union. This conduct also avoids the necessity for a late operation, which would be far more complex, and also shuts the door against infection. Spontaneous cicatrization, which is possible in the case of very superficial lacerations, is the great exception when the tear has been deep. Although Pajot, Tarnier, and Guéniot have observed cases of this kind, we have no reason to expect so fortunate a termination of the accident.

The simplest and easiest plan of uniting the laceration is the hem suture on superposed planes,[6] which re-establishes the previous condition of the parts by taking advantage of the fresh surfaces of the laceration. This suture is far better than the use of serre-fines, which are not strong enough for anything more than slight tears of the cutaneo-mucous fold of the fourchette. As the procedure is very rapid, local anæsthesia with cocaine is sufficient, applied superficially or by means of the hypodermic syringe. The catgut sutures disappear of themselves, and do not require to be extracted. The patient should have her thighs maintained in apposition, and be forbidden to sit up in bed during the first fifteen days, and the parts must be carefully kept clean with sublimate solution and iodoform in powder.

When the surgeon has not interfered immediately, should he perform secondary immediate union during the first month, as has been proposed, either by bringing the granulating surfaces together or by scraping off the fleshy granulations with the cutting curette?[7] Success has been obtained in this way, but I think that it has more defects than advantages, and that it is better to wait until the local congestion has disappeared, and the woman is in condition to endure an operation.

Verneuil[8] has advised immediate secondary union even in old cases, and employs the thermo-cautery for the purpose of freshening the surfaces, suturing them after the fall of the eschars This procedure must not be confounded with angular cauterization of the laceration analogous to the method of Jules Cloquet in fissures of the palate, which has been used in certain cases to diminish the extent of a tear involving the recto-vaginal septum, which I have employed at times with success.

OLD LACERATIONS OF THE PERINEUM. *Historical Review.*— The first operation for the repair of the perineum with sutures was performed by Guillemeau, a French surgeon, in the seventeenth century.[9] In the following century La Motte, Smellie, Noel (of Rheims), Murenna, and Saucerotte[10] attempted it with more or less success. More recently, Dieffenbach, in Germany[11] advocated a method which has served as a model for many procedures, and has been perfected and introduced into France by Roux.[12] The characteristic of Dieffenbach's method consists in a large denudation of the surfaces to be united, and in liberating incisions, of which we find a trace in Mercier's,[13] and Baker Brown's[14] division of the sphincter; the capital point of Roux's method was the quill suture, employed for a wound which was much larger than those customarily closed in this manner. With Langenbeck a new method arose, called perineosynthesis, based upon a combination of denudation and autoplastic division, which has given birth in France to the methods of Demarquay,[15] Richet,[16] Le Fort,[17] Marc See,[18] and Polaillon;[19] and in Germany to those of Simon,[20] Wilms,[21] Staude,[22] Bischoff,[23] Hegar,[24] Hildebrandt,[25] Freund,[26] and others.

In America, Marion Sims in the year 1855 applied to the repair of the perineum the same simple and precise principles which had guided him in the treatment of vesico-vaginal fistula. Freeing the operation from all useless complications, especially the different planes of suture, he repeated the procedure of Roux, carried the denudation higher up, and employed metallic sutures. This was a great improvement, preceding and preparing the way for his pupil and friend Emmet.[27] The originality of the latter's method consists in the suture employed, which has for its object the exact coaptation of the wound surfaces as one closes a purse, and also in the care with which the sphincter is reunited by a special suture of its divided ends, by the application of a sub-sphincteric thread very deeply and obliquely from behind forward. This procedure, which is derived from Marion Sims' and improves it, has been generalized in France by Judes Hue[28] and adopted by Verneuil,[29] Trélat,[30] and the majority of surgeons.

It might be thought that the operative technique had arrived at the highest point of simplicity; but Lawson Tait[31] perfected the method of John Duncan and Simpson,[32] and reduced the operation to a rapid division or splitting of the recto-vaginal septum followed by the application of a few sutures, which altogether requires only from five to

ten minutes to accomplish. This has been quickly adopted in both America and Germany, with or without modifications.[88]

I shall not attempt to describe each of these various methods, but shall limit myself to the principal ones, giving references enough to the literature of the subject, so that the other methods may be readily found.

Incomplete Lacerations.—All of the procedures of colpo-perineorrhaphy which I have described in the chapter on Genital Prolapse

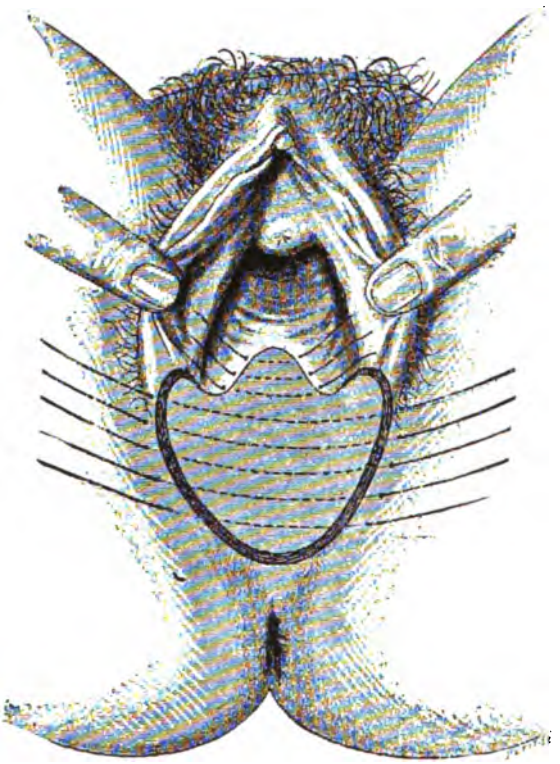


FIG. 102.—INCOMPLETE RUPTURE OF THE PERINEUM; PERINEORRHAPHY. Simon's method.

find here their special application. There is only a difference in degree and great similarity between relaxation of the perineum, which is one of the most important elements in the production of prolapse of the vagina and uterus, and these incomplete lacerations. In the first case the skin resists and there is no external cicatrix, while in the second the opposite is true; but there is one factor common to both: the tone of the deep muscular plane has been strained, the fibrous framework of the parts has been irremediably over-distended, and the static condition of the uterus has been similarly modified. Relaxation

of the perineum may thus be considered as an actual subcutaneous laceration. By seizing the recto-vaginal septum between finger and thumb introduced into the rectum and the vagina, it is evident that the fleshy pyramid which separates these canals has diminished in size and consistency. This coincides with the wide shape of the intact fourchette, the gaping vulva, more marked when the patient is placed in the semi-prone position of Sims, the lessened depth of the anal orifice and the unusual breadth of the perineum, which is enfeebled and lax.

For the means of consolidating the perineum I refer to p. 498, Vol. I., where the various methods are described. I will give the figure (102) of Simon's procedure for incomplete rupture,[34] as his method of denudation and suture suggested Hegar's for complete laceration.

Emmet's Method.[35]—[As the admirable method of this distinguished author has not been clearly described in any of the more recent works on gynæcology, I take the liberty of substituting the following description for that of Professor Pozzi.

To lessen the difficulties in the way of an intelligible description, I will briefly review Emmet's views on the subject of perineal tears. He believes the term "laceration of the perineum" a misnomer and only allowable where the sphincter ani is involved. He denies any supporting function to the perineal body, as it can be clearly demonstrated that the uterus is supported and swung from above, like every other organ in the body, and, with the vagina and rectum, kept in position by the connective tissue and fascia of the pelvis. This fascia is in close connection with the cellular and connective tissue of the pelvis, and is attached alongside the vagina and rectum, so as to prevent undue prolapse of the bowel from the sigmoid curve to the anus. While supporting the vagina, it exerts lateral traction with the effect of preserving the natural curve, and keeping the two sides in close contact.

The grooves or sulci formed by the flattened vaginal sides are the result of the lifting of the posterior wall up to the anterior one, while at the same time the needed degree of lateral traction is exerted by the fascia. If we trace the course of the fascia forming the sulci from the starting-point at the superior strait, and alongside the vagina to the point where that canal pierces the muscular diaphragm at the pelvic outlet, it is seen to be reflected on to these muscles. This fascia binds the whole muscular mass in a common sheath, strengthens it, and, so long as its integrity is preserved, maintains the pelvic circula-

tion in normal equilibrium. When the fascia gives way, the vessels lose their support, no longer continue tortuous, become engorged, and give rise to the symptoms well known to accompany cases of neglected laceration.

To understand the mechanism of laceration it is necessary to recall certain points in the arrangement of the perineal muscles. On the outer side of each levator-ani muscle, and extending along its attachment, the transverse perinei are inserted and extend backward and outward to the ischia. Normally their action binds more firmly together the muscular floor of the pelvis; but as soon as the levators are separated in front, the transverse perinei can only draw them more apart, as curtains may be drawn apart below, while united above. In injuries to the pelvic floor, a force comes into play by which the fascia is torn and the levator-ani muscles in front widely separated; this may occur without injury to mucous membrane or skin. Consistent with this belief, the object of Emmet's operation is to catch up the retracted fascia at such a point and manner as to take up its slack throughout the pelvis. By his procedure the posterior vaginal wall is lifted upward and forward in contact with the vesico-vaginal septum, the everted tissues at the vaginal outlet are rolled in and the separated levator muscles brought together so that the woman becomes apparently perfectly normal.

The first step in the operation is to determine, as closely as may be, the degree of retraction of the fascia along the sulcus on either side of the vagina. With the patient on her back, the limbs flexed, find a point in the middle of the projecting mass within the vagina, pick it up with the tenaculum, draw it forward and upward toward the neck of the bladder, and two folds will be seen leading up to a point within the sulcus on each side. These points indicate the limit of retraction, and show clearly that the portion of the vagina above is still properly supported. This triangular-shaped tongue or portion of rectocele drawn forward by the tenaculum forms, after the operation, the posterior wall of the vagina; and all the mucous surface below it is to be denuded. The tenaculum holding it is to be replaced by a stout thread to form a landmark and be held by an assistant. Then a tenaculum is hooked into the caruncle on either side, and lateral traction made by assistants. A gutter-shaped, triangular surface is thus formed on either side of the canal, with its apex running into the lateral sulcus. Then drawing down with a third tenaculum hooked into the centre of the posterior vaginal wall at the muco-

cutaneous junction, you have the whole surface to be denuded clearly shown. By approximating the crest of the rectocele and the two caruncles, you see how the parts will be brought together when the sutures are introduced.

In inserting the sutures, begin at the apex of the triangle in each sulcus, and put them in about a quarter of an inch apart until the loop in the centre of the rectocele is nearly reached. Then a suture is inserted just behind the caruncle on the right side, dipped into the denudation in the rectocele, and brought out at a corresponding point on the left. This "crown suture" draws the crest of the rectocele near the caruncles, closes the sides of the vaginal outlet, and brings together the levator-ani muscles. Three or four other sutures are passed in a similar direction below this, as in an ordinary perineum operation. Emmet prefers sutures of silver wire. They are tied in the order of their insertion. The line of union when all is complete is like a rounded letter Y, the branches of which are completely hidden in the vagina, while the stem bends over at a little more than a right angle, on the external perineal surface.]

Lawson Tait's Method for Incomplete Ruptures.—The description here given follows that of Sänger, who has made some unimportant modifications in it;[86] the method is also applicable to simple relaxation of the perineum, although open to the objection that it then leaves a pouch behind the reconstituted perineum.

Sänger advises that the rectum be first tamponed with cotton, sponge, or iodoform gauze covered with vaselin and furnished with a thread; in this way the posterior vaginal wall is pushed forward. Two fingers are also placed in the rectum while an assistant stretches the operative field as much as possible, by drawing the sides of the vulva toward the ischial tuberosities; thus the posterior vaginal wall is displayed to a very large extent. To form the flap, Tait uses pointed scissors, elbowed like those of Roux. One point is inserted from before backward in the median line of the posterior commissure of the vulva at the muco-cutaneous junction, and the recto-vaginal septum split to the depth of about a half or three-quarters of an inch, first on the left side and then on the right. At the ends of the transverse incision thus formed two vertical cuts are made up to the point where he wishes the posterior commissure to be; the three incisions roughly have the form of a quadrilateral which lacks its upper side [or better a semicircle following the muco-cutaneous junction]. The horizontal side is from 2 to 3 cm., and the two vertical sides from 3

to 5 cm. When the flap is sharply drawn upward by tenacula and the edges of the wound well separated, such bands as still need to be divided in order to give a smooth and sufficiently large wound are readily seen and cut. The vivified surface then has the form of a quadrilateral with obtuse angles; surrounded on three sides by the skin, it gives insertion by its fourth to the mucous cap resulting from the splitting of the recto-perineo-vaginal septum. That the flap may not be too thin, the septum must be split exactly in the middle, which is facilitated by the control of the fingers placed in the rectum. On the borders the incision is carried deeply into the cellular tissue of the perineum and the labium majus. The denudation may be completed in about half a minute; and if the surface so obtained is not smooth, but covered by small irregularities, these may be removed by the scissors.

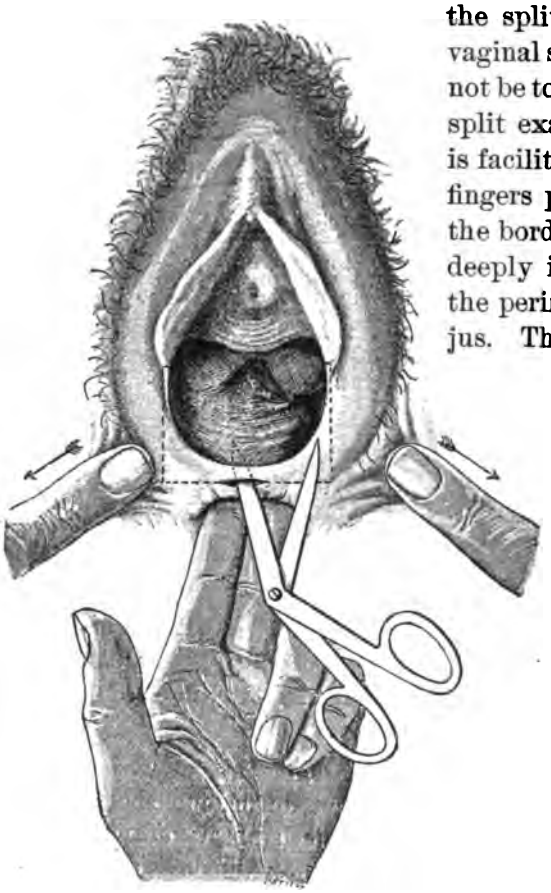


FIG. 103.—INCOMPLETE RUPTURE OF THE PERINEUM; PERINEORRHAPHY. Tait's method.

FIG. 104.—INCOMPLETE RUPTURE OF THE PERINEUM; PERINEORRHAPHY. The Tait-Sänger method, suture.

The bleeding is ordinarily quite free but is venous; when small arteries are cut, they merely require forceps and torsion. Sänger never employs ligatures. Occasionally he has tied the bleeding points

with fine catgut when torsion and forcipressure were not sufficient; but the apposition of the lips of the wound is sufficient usually to assure control of the hemorrhage.

The sutures are passed under the control of the index and middle fingers of the left hand placed in the rectum; the point of a Peaslee's needle enters the tissues within the left border of the wound, and passes transversely across to emerge at the corresponding point on the other side, the skin not being included at either point; a silver suture is introduced into the eye of the needle, which is then withdrawn in the usual manner. Four are enough, and they should penetrate the recto-vaginal septum a little beyond the point where it has been divided; they are tied between the flaps of the wound after it has been carefully washed with sublimate solution (1 in 1,000) and the rectal tampon has been removed. The edges of the wound are then brought together; but as the sutures of silver are obliged to emerge through the line of union, it is not exactly rectilinear, although between them the apposition is perfect. Toward the anus there often remains a fold which corresponds to the lower transverse border of the denudation on the vaginal surface, the layer of mucous membrane forming an open fold or crease anteriorly, or a small rosette.

Tait does not use any superficial sutures. Sänger thinks it better to employ them; for if one operates antiseptically there is no need, he says, of keeping the external opening for drainage, as Tait is accustomed to do. The silver wires are cut short, and their ends are fastened with a shot, which is crushed over them.

[Silkworm gut, which possesses many advantages over silver wire, is now commonly employed, and the sutures are entered about one-eighth of an inch from the skin margin, but otherwise as described above. They are tied in the same order that they are inserted, from the sphincter upward. A few superficial catgut sutures are usually needed to insure perfect coaptation of the skin edges and of the remains of the flap at the new posterior commissure.]

The dressing consists of insufflation of iodoform and iodoform gauze which envelops the silver sutures; the iodoform is applied twice a day until there is a thick layer of it below which the wound remains perfectly dry. During the first three days the catheter must be used; on the seventh, the superficial sutures are removed, and on the fourteenth the deep series; then the patient may leave her bed. [See also after-treatment of complete laceration, p. 385, many details of which are applicable here.]

Martin has modified the suture in a way which I consider very advantageous.[37] Instead of silver at separate points, he employs juniper catgut, and a continuous suture on superposed planes; the operation is thus very rapid and the coaptation perfect.

Complete Ruptures of the Perineum.—The triangular denudation of Simon has been adopted and perfected by Hegar. He starts with the principle that, if the perineum has been torn from three surfaces, the suture should be made in three directions, taking in successively the vagina, the rectum, and the skin. Hegar makes a denudation which has the shape of a butterfly with extended wings, its body corresponding to the recto-vaginal septum. He does not split the septum, but merely excises the cicatricial tissue and the mucous membrane to obtain a sufficient wound surface for the purpose of perfect coaptation.

The following are the different steps of the operation:

Method of Simon-Hegar: First Step—Denudation.—To expose the field of operation in the most complete way, an assistant lifts up the anterior vaginal wall with a large retractor, while the surgeon seizes the posterior wall with the toothed forceps above the point *x* (Fig. 105). Hegar introduces into the rectum, especially if there is prolapse of the rectal wall, a sponge soaked in chlorine water and secured by a string, to prevent soiling the skin with fæces. The skin is then seized with forceps at the points which correspond to the extremities of the new perineum; that is to say, anteriorly on the internal surface of the labium majus at *a* and *b*, and behind near the border of the anus at the points *c* and *d;* these points are stretched apart, and the dissection begun in the triangle *nxn*. The point *x* is situated in the middle line of the posterior vaginal wall, and at a distance of 2 cm. above the point *e*, which represents the extremity of the triangle vivified on the rectal surface. By the excision of the small mucous triangle with its apex directed toward the posterior vaginal pouch, the projection of the extremities of the flaps is prevented, which would otherwise take place when the sutures are tightened, and the apposition of the lateral portions of the denuded surface in the median line is much facilitated. Moreover, by this method greater solidity is given to the recto-vaginal septum, for the points *x* and *e* on the vaginal and rectal surfaces represent the highest points of the line of denudation, and are farther removed from each other than they would be if *x* were at the middle of a straight line between *n* and *n;* and this increased thickness assures the prevention of recto-vaginal fistula.

Starting from the points *n*, *n*, a curved incision is made, convex forward, directed upward and outward, reaching to the points *a*, *b*, which when united form the new fourchette; these points are situated on the internal border of the labium majus at the level of the lower caruncles. From here the incisions *ac* and *bd* are traced, from 3 to 4 cm. in length, which by their union form the raphé of the new perineum; these incisions are directed downward toward the point where the anus will be formed, and from this point the lines *ce* and *de* are bent inward; they are best made with the scissors. The edges of the flap thus marked out are freed with the bistoury by cutting about 3 mm. with the knife, held flat, and the portion of tissue so circumscribed is then dissected off and the denudation completed.

Along the lateral portions of the wound there are many important veins which are at times injured, and the hemorrhage is then quite

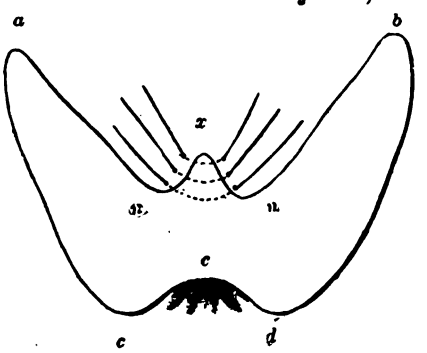


FIG. 105.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Simon-Hegar method, denudation.

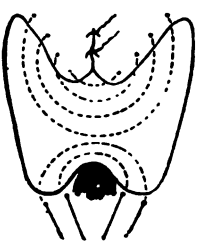


FIG. 106.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Simon-Hegar method, vaginal and rectal sutures.

free; the bleeding points may be compressed with a small tampon of wet cotton, or if necessary by forceps for a few minutes; it is seldom necessary to tie them. When forcipressure has been employed, the portions of tissue which have been compressed between the jaws of the forceps should be cut away before tying the sutures, the exact apposition of the flaps sufficing to stop the hemorrhage completely.

As Hegar remarks, when the operation is performed for the first time, the fault is usually committed of making the denuded surface too large, which uselessly extends the wound surface and increases the difficulties of exact reunion. The other fault, of denuding the surface to be united in such a way that the points *c*, *d* are situated too far outward, should also be avoided, for then there is great difficulty in bringing the lines *ed* and *ec* exactly together (Fig. 105).

Second Step—Suture.—When the wound has been equalized, we begin by suturing the edges of the triangle *nxn* (Fig. 105). For this purpose Hegar uses curved needles in a needle-holder. The needle enters the mucous membrane 3 mm. from the border of the wound, passes transversely through the whole extent of the denuded surface, and emerges 3 mm. outside of the opposite edge. If the triangle *nxn* is very large, too great a mass of tissue must not be included in the suture, but the needle goes through a portion of the wound, and omits part of its extent in the median line; in this way the apposition of the two sides is better secured.

When the vaginal suture has been completed, a few sutures are taken in the rectum. Here the needle is passed 2 or 3 mm. from the border of the freshened surface from below upward; after traversing a certain extent of the tissue, it is drawn out, seized anew by the needle-holder, and passed through a corresponding point of the opposite surface, and then directed from above down and out toward the skin; the ends of the threads hang in the rectum. Instead of passing the sutures as I have described, a needle may be used on each end and passed from above downward, and from within outward on either side of the lateral portion of the denuded surface. As it is very difficult to remove metallic sutures from the rectum when they are very short, Hegar consequently employs catgut or fine silk for the rectal sutures and abandons them altogether.

The sutures may be fastened in either of two ways:

1. All of the threads may be passed and then tied, as Hildebrandt is accustomed to do.

2. Or, as Hegar prefers, the first, which is situated most deeply, may be passed, drawn tight, and tied; then the second, and so on, thus continuously equalizing the lips of the wound, and proportionately modifying the position of the sutures and correcting the shape of the denuded portion.

When the rectal and vaginal sutures are all in place and fastened, the perineal series is to be introduced (Fig. 107). Here the ordinary rules are followed. During the process of securing the sutures, the thighs of the patient should be brought together to diminish the tension; it is advantageous to place the patient in the dorso-sacral position for this step of the operation.

The disposal of the deep and the superficial sutures varies. Dieffenbach employs deep sutures only on the perineum; Simon attaches great importance to sutures of both the vagina and the rectum. More

recently Simon regards it as of great benefit to apply the deep sutures from the rectum, and those which are more superficial from the vagina. Hegar prefers deep sutures on both rectum and vagina, although he does not limit their application wholly to these surfaces; the capital point, he says, is to leave no space where the walls are not exactly in apposition and where fluids might collect.

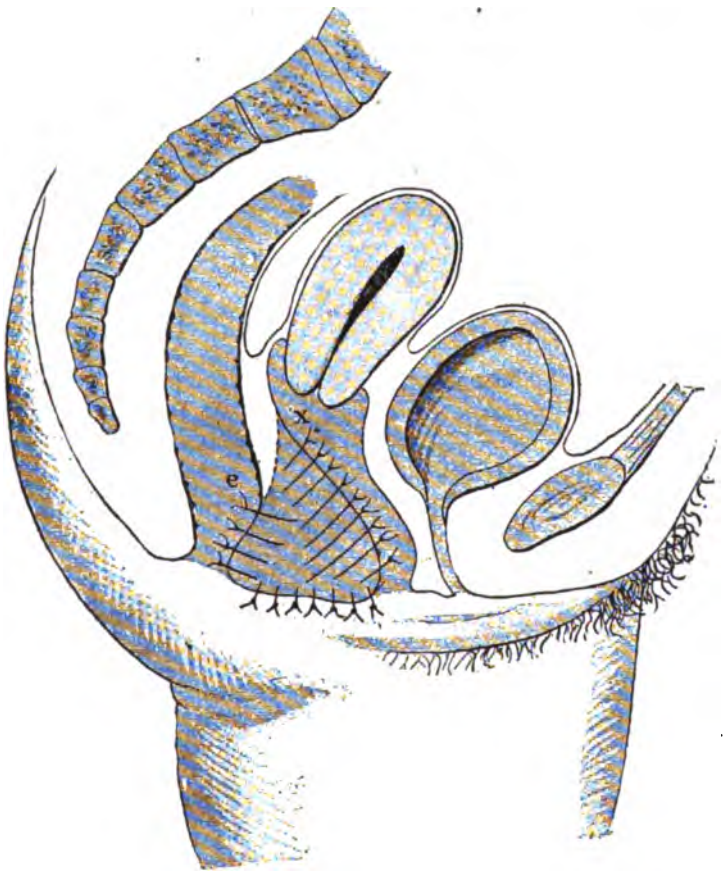


FIG. 107.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Simon-Hegar method ,general disposition of the sutures.

When the laceration is very extensive, Hegar modifies his usual procedure. If the laceration reaches up the rectum more than four centimetres, the denuded surfaces on the recto-vaginal septum are so narrow that a single series of sutures will be sufficient, which embrace the whole thickness of the partition and are tied upon the vaginal surface; if two series be employed, they may not include a sufficient amount of tissue. On the other hand, with a single series we might

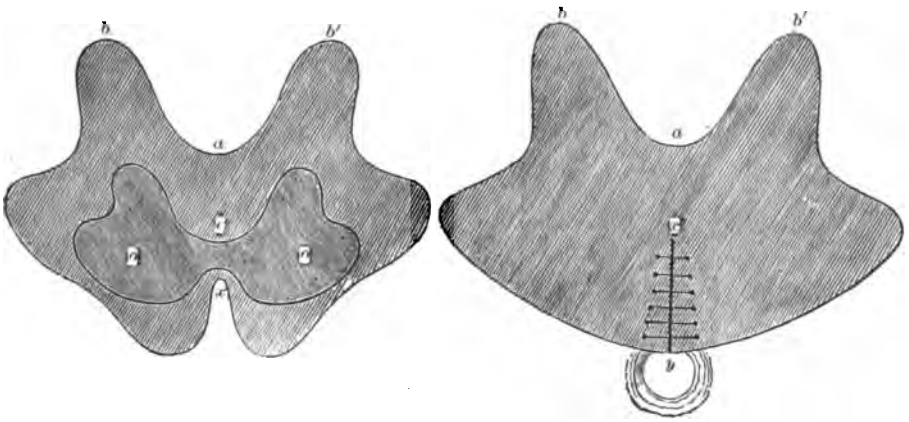
fear that the apposition would not be quite regular; but this inconvenience may be avoided by alternating the deeper set which include the whole septum with others which take in the vagina alone. Lower down on the perineum, where the vivified surfaces are more extensive, a double suture may be employed, as described above. If the solution of continuity is very great, a terrace suture on several planes may be employed. A certain extent of the surface is denuded and a suture applied at this point; then another portion, which is treated in the same way; by operating thus, we avoid free bleeding, and a large extent of wound is not exposed to the action of the air for any length of time.

When the sutures are all in place, the little collection of blood between the flaps should be squeezed out, and rectum, vagina, and perineum well irrigated with antiseptic fluid.

Hegar then performs a subcutaneous or open section of the anal sphincter by making two lateral incisions in its posterior edge. This procedure sometimes gives rise to free hemorrhage, but it is easily controlled by ligature or forcipressure. According to Hegar, the section of the sphincter is an advantage, in that it permits the free issue of fæces and gas during the first few days, which if allowed to accumulate would distend the walls of the canal and thus interfere with proper union; it also prevents all dragging upon the rectal suture. Baker-Brown also cut the sphincter, but his incision was made posteriorly toward the coccyx. Hegar has returned in recent years to the lateral liberating incisions of Diffenbach, which he had formerly employed; these are incisions parallel to the line of union of the denuded flaps, extending to the cellulo-fatty subcutaneous tissue. But the tension is not very great when the operator has been careful not to make the denuded surface too large; and the presence of two open wounds so close to the line of suture is not free from danger, for they may be means of entrance for infection.

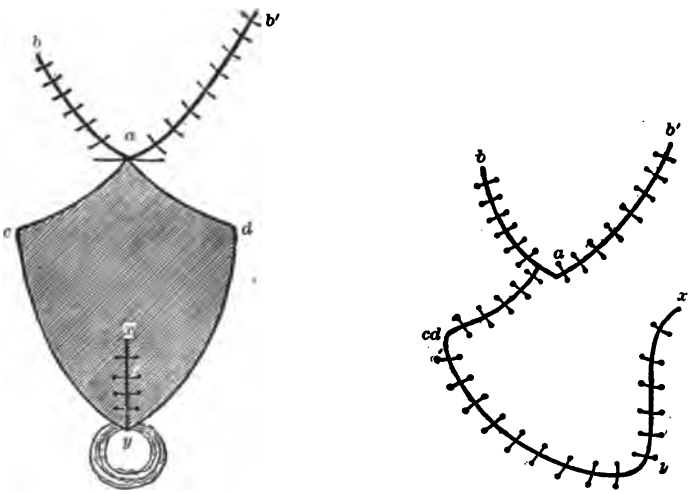
Freund's Method.—Freund has insisted with much force upon the necessity of making the denudation in such a way that we reproduce the state in which the perineum is found immediately after the tear. If the flaps are made in the usual manner, the suture includes with great traction parts which normally are never in apposition. Freund, therefore, dissects out a surface whose form is wholly subordinated to that of the solution of continuity. If, for example, there is a cicatrix which has the form *oo* (Fig. 108), it is the remains of the initial laceration which has contracted, which may be designated by the line

b a b' x. Freund incises the posterior column of the vagina in such a case at a certain distance from its extremity, and at the sides of this column carries the bistoury backward toward the point *b b'* (Fig.



FIGS. 108 AND 109.—FREUND'S METHOD OF PERINEORRHAPHY. Area of denudation.

108) in such a way that he circumscribes the cicatrices on the vaginal surface and on the labia majora, and completes the denudation in the ordinary manner. He sutures the line *x y* (Fig. 109),



FIGS. 110 AND 111.—FREUND'S METHOD OF PERINEORRHAPHY. Disposition of sutures.

which corresponds to the rectum; then he unites each edge of the posterior vaginal column to the external lip of the denuded surface on the lateral portion of the posterior vaginal wall, forming the lines *a b* and *a b'* (Fig. 110). There remain then only the incisions *a c* and

a d, whose union forms the internal portion of the vulva, and the lines *c y* and *d y*, which form the external perineum (Fig. 111).

Hildebrandt's Method.—In this procedure the denuded area has the form of a trefoil, and the sutures are fastened on the cutaneous surface except for a small part of the wound. The vaginal sutures are first passed, then the rectal, then the deep sutures which are tied on the perineum; thus he avoids the production of a space between the rectal, vaginal, and perineal wall, which may serve for the accumulation of blood and the formation of abscess (Figs. 112 and 113).

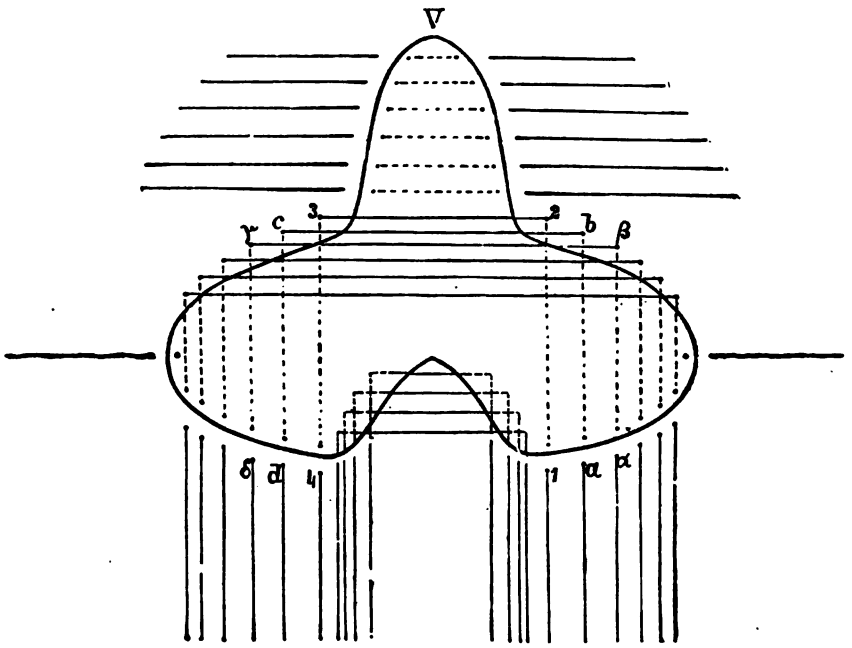


FIG. 112.—HILDEBRANDT'S METHOD OF PERINEORRHAPHY.

Heppner's Method of Suture.—Heppner has had the same object in view in proposing a suture of the shape of the figure "8," which is intended to assure at the same time complete apposition on both the vaginal and perineal surfaces. Its method of application is shown in Fig. 114.

Lauenstein's Method of Suture.[38]—This procedure has for its object the prevention of infection of the sutures from the rectal and vaginal secretions.[39] Lauenstein introduces the sutures about one-half centimetre from the borders of the wound and within the bleeding surface, making buried sutures of catgut at separate points, according to Werth's[40] plan. When the rectal and vaginal mucous

membranes are sufficiently coapted, he diminishes the depth of the wound posteriorly by a few more hidden sutures, and then completes the perineum with silver wire (Figs. 115 and 116).

Martin's Method of Suture.—Martin denudes the part in the same manner as Simon, but employs a method of suture which is very rapid and completely prevents the imperfect apposition for which Hildebrandt and Heppner have invented their ingenious but complicated procedures. He makes a continuous catgut suture, starting as for colporrhaphy at the superior angle of the wound, closing the rectum first by a few points which start from the intestinal mucous membrane, penetrate the bleeding surface, and come out again in the rectum. When the intestinal suture is complete up to the anus, with the same thread, but in a contrary direction, a first plane of suture is placed in the wound itself, going up to the superior angle in the vagina, from which the suture first started. If this one plane is sufficient, the lips of the vaginal wound are united, and then the perineum; but if the bleeding surface is of great extent, a second plane of suture is employed before uniting the edges (Fig. 117).

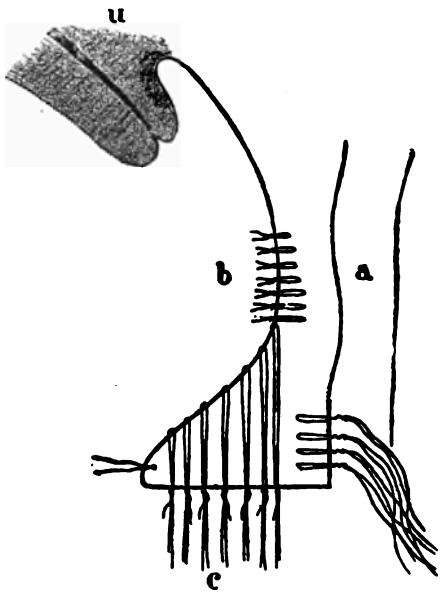


FIG. 113.—HILDEBRANDT'S METHOD OF PERINEORRHAPHY. General disposition of the sutures. *u*, Uterus; *a*, rectum; *b*, vagina; *c*, perineum. (Vertical section.)

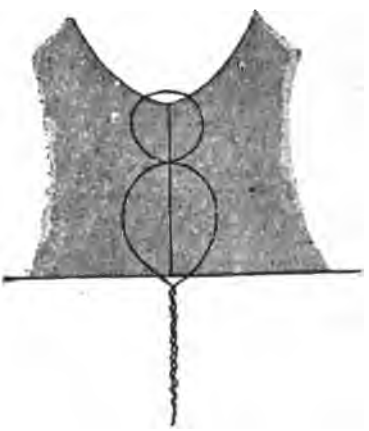


FIG. 114.—HEPPNER'S METHOD OF SUTURE IN PERINEORRHAPHY.

Le Fort's Method[41] resembles Demarquay's, from which it was derived, although with a number of ingenious modifications.

It is applicable to complete lacerations which involve the entire length of the recto-vaginal septum. After separation of the sides of

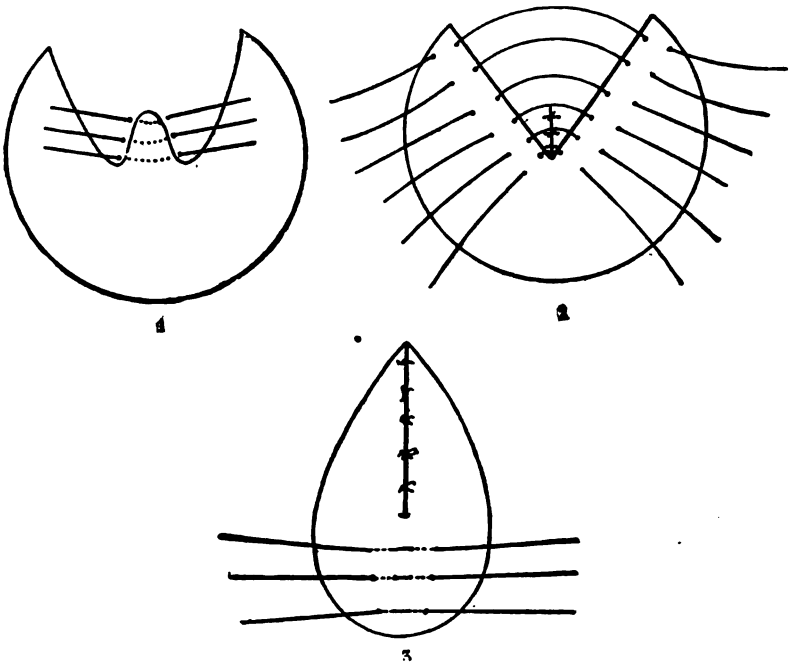


FIG. 115.—INCOMPLETE LACERATION OF THE PERINEUM; LAUENSTEIN'S SUTURE. 1, Suture of the anterior angle by the usual method; 2, submucous suture of the vaginal wall; 3, buried sutures in the depth of the wound.

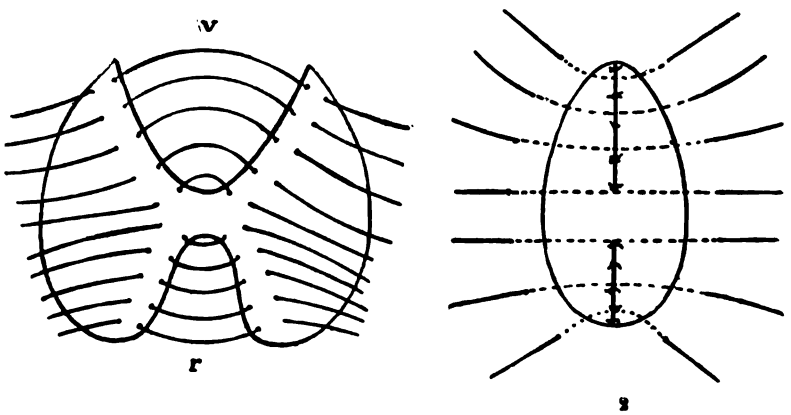


FIG. 116.—COMPLETE LACERATION OF THE PERINEUM; LAUENSTEIN'S SUTURE. 1, Introduction of the sutures which coapt the vaginal and rectal mucous membranes; 2, introduction of the perineal sutures after the vaginal and rectal have been fastened.

the vulva, an incision is made in the central intact portion of the septum at the point C (Fig. 118, 1), one centimetre in length, and including only the vaginal aspect of the septum; then a slightly convex

incision is made from C, following the lines C, D, E, and rising to the point E; from the same point C another incision CG is carried along the rectal portion of the remains of the septum, but without involving the rectal mucous membrane, to the sides of the anus.

These two incisions are separated by an acute angle; their extremities are united by a third curved incision EIG, which with them describes the triangle H, over which area the skin and cicatricial tissue are removed, so that there is a freshened triangle on each side. At this point of the operation the vaginal part of the septum is seized at the edge of the incision CDE with toothed forceps, and split as far as

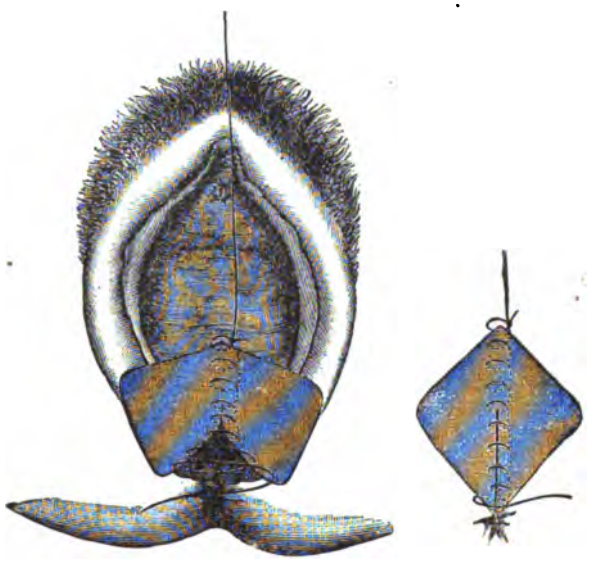


FIG. 117.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Martin's method. *a*, Deep plane of continuous suture; *b*, passage from the deep to the superficial.

the dotted line CE, which liberates the vaginal layer D, destined to be united by its deep and bleeding surface to the similar layer from the other side. This union is made in three planes as regards the septum: a rectal plane, formed by the suture of the two rectal edges; a vaginal plane, consisting of the two small flaps D; and a large intermediate plane formed by the junction of the two denuded triangles H.

To repair the rectal portion, a series of interrupted sutures is placed along the lines C, G, beginning at the flap C; the needle is introduced on the left border and passed from the rectum toward the vagina, then in the right flap (Fig. 118, 2) from the vagina toward the rectum. When the first suture has been drawn tight, a second is

placed in the same manner, then a third and a fourth, until the anterior wall of the rectum is wholly reconstructed down to the anus, although the separation from the vagina is by a very thin partition. Next the intermediate portion of the septum is formed, by adjusting the triangles H; the first thread is introduced outside of the line CE (Fig. 118, 3), at the point where the small triangle is inserted. The needle passes from above downward and from right to left in the thickness of the tissues, turns at the median line, ascends at the same depth in the substance of the opposite side of the wound, to emerge at one-half centimetre from the line CE; three or four such threads are passed in the same manner through the part which is to be the deepest portion of the septum. During this entire step of the operation the finger is kept in the rectum to serve as a guide and prevent the sutures from entering the cavity of the rectum; the sutures are placed, but not tightened until those for the perineum and the sphincter are in position; these are three or four in number according to the dimensions of the perineum. For the perineal series the needle enters at one and one-half centimetres from the perineal border of the denuded triangle H (Fig. 118, 3) penetrating to the depth of 1 cm.; the first suture being introduced near the point E, the second at G, and if necessary a third between the preceding. The ends of the three are united on either side by a quilled suture formed with a piece of rubber tube pierced with holes. The action of these sutures is exerted upon the deeper portions of the denuded surface and tends to bring the recto-vaginal septum toward the surface of the perineum. Before applying the rubbers and tying the sutures, the vaginal sutures are drawn tight, and in proportion as this is done a few superficial stitches are taken in the small vaginal flaps D, D; when the sutures are complete, Le Fort makes Dieffenbach's incisions if there is much tension.

Richet's Method.—This procedure is derived, like the preceding, from Demarquay's, but it presents many points which are original. It has been well described by Picqué,[42] from whom I take my description.

In the first step a curved incision is made a little distance from the free border of the recto-vaginal defect, circumscribing it, and permitting the division of the vaginal wall from the rectal portion of the septum. This incision is prolonged upward on each side at the mucocutaneous border as far as the cicatricial surface caused by the laceration extends, which is then denuded in the form of a butterfly. When

the incision and the denudation have been performed, Richet splits the septum in such a way that the area of surface thus exposed increases in proportion to its vicinity to the perineum, but even at its broadest portion the denuded surface does not exceed 8 to 10 mm. In this condition when the two portions of the divided perineal body are finally united, the flaps of the horizontal laceration are pressed together and form a projecting median fold.

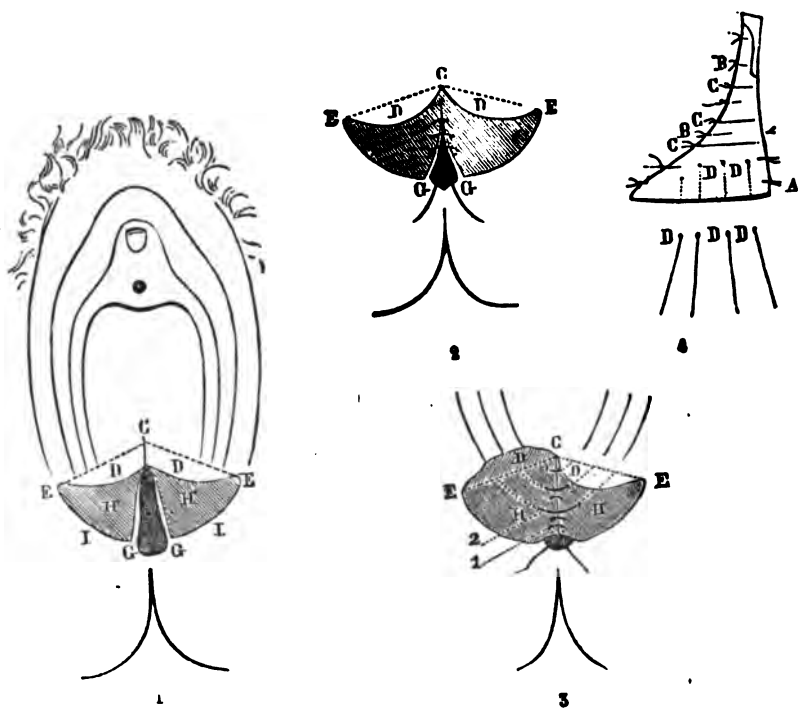


FIG. 118.—COMPLETE LACERATION OF THE PERINEUM. Le Fort's method. 1, Lines of incision; 2, repair of the rectal wall, line of the sutures; 3, repair of the vaginal septum; 4, vertical section showing the disposition of the sutures.

In the second step the borders of the vaginal flap are brought together by their bleeding surfaces and secured with a few sutures whose ends are laid over the mons veneris. The posterior sutures are placed first. The anterior sutures should not be completed before the perineum is united, except where the defect is of small extent. The apposition of the flaps by their bleeding surfaces produces a projecting median fold.

The third step includes the formation of the perineal body by the union of the lateral denuded surfaces by three or four quill sutures deeply placed to secure as perfect apposition as possible. Richet

thinks that this method of suture makes the coaptation very sure. To avoid ulceration at the insertion of the sutures, he ties them over bits of rubber tube with compresses of carbolic or iodoform gauze beneath, which keep them from the skin, each suture being independent of the others. When the rectal and vaginal sutures are complete, he adds, if necessary, a few superficial stitches on the perineum. This method requires, therefore, two lines of sutures, perpendicular to each other; Richet employs no suture in the rectum.

Emmet's Method.—This method has been made known in France by Judes Hue's writings, who followed Gaillard Thomas in his description, and clearly brought out the original points of the method, by which he had obtained many successes. The exposition of the subject and the figure which he gave do not, however, seem to correspond exactly to the original operation of the author, especially as regards the anterior portion of the denudation and the suture.[43] It is not absolutely necessary, as he repeatedly says, to have a long curved needle mounted on a handle. Emmet uses an ordinary needle,[44] which he inserts in the upper part of the denuded area and reintroduces, after passing it a certain distance, through the same point from which it emerged. With these reservations, the following is borrowed from Kirmisson, and the figures from an article by Hanks,[45] a colleague of Emmet.

The patient is anæsthetized and placed in the lithotomy position, two assistants supporting the lower limbs on either side. The operator first carefully cleanses the anal, vaginal, and perineal regions with antiseptic fluid, and then proceeds with the denudation as in the other methods. On each side of the lacerated perineum a denuded triangle is formed whose base is the skin, from the anus to the lower caruncle, the apex being just above the upper limit of the rectal tear. These two triangles are united in the median line above the tear in the septum for about 3 cm. The resulting figure has the form of a butterfly with extended wings, the central portion of the denuded area representing the body of the insect, and the lateral portions the wings (Fig. 119).

The limits of the vivified surface should first be traced with the bistoury to assure their symmetry, for it is necessary that they should correspond in every point. A very important precaution is to begin the dissection below at the median line, for otherwise one is incommoded by the blood flowing from the upper and lateral parts of the denudation. The finger of the assistant, in the rectum, stretches the

septum and makes it project forward, rendering the vivification of the median part more easy; during the dissection on the lateral portions it is equally necessary to have the assistant draw the part under the knife tense by gentle traction outward. When the required surface has been prepared, the field of operation should be cleared of blood and all oozing stopped by the application of a cold antiseptic solution (weak boric or carbolic acid or bichloride). Then the suture is begun, which is the special point in Emmet's method. The sutures

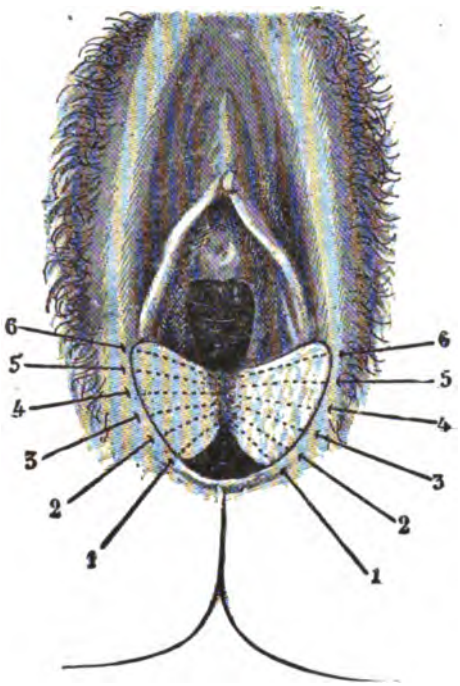


FIG. 119.—COMPLETE RUPTURE OF THE PERINEUM; PERINEORRHAPHY. Emmet's method; the freshened surface and the sutures in place.

are placed with a needle mounted on a handle and strongly curved (Fig. 19, Vol. I.), or with a large Hagedorn needle firmly held by my holder (Fig. 21 and Fig. 24, 3, Vol. I.), and medium-sized silver wire is used; they are passed from behind forward. On the left side of the perineum the operator inserts the point of the needle held in the right hand, about 1 cm. external and posterior to the posterior margin of the anus. It then traverses the lower part of the recto-vaginal septum, to emerge on the right side of the anus at a point exactly opposite its insertion. If the tissues are very thick, it is better to pass the needle in two motions, penetrating first to the septum, withdraw-

ing it and reintroducing it so that it exactly reaches its point of exit. During the whole of this step the introduction of the finger into the rectum is absolutely indispensable; it stretches the septum, guides the needle, and prevents its issue in the cavity of the rectum. This manœuvre of passing the sutures demands great attention on the part of the operator, and should be performed with a certain gentleness, in order that the needle may not enter the rectum or lose itself in the tissues, and emerge at a point which is not symmetrical with its insertion. Four or five sutures are placed in this manner. Intro-

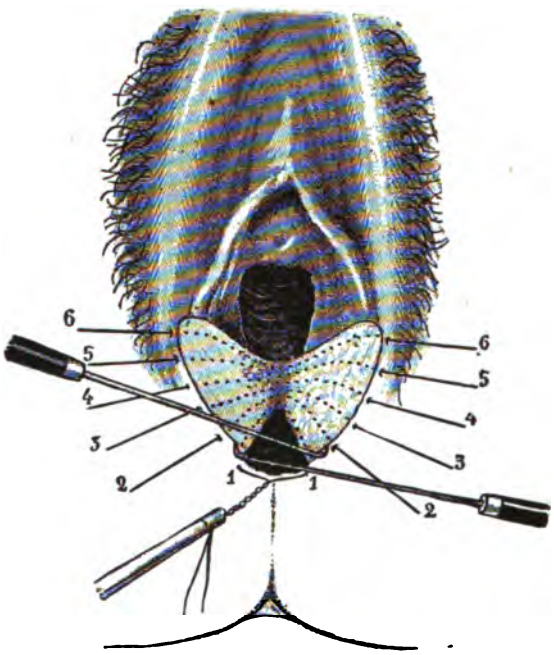


FIG. 120.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Emmet's method; tightening the posterior suture, which includes the sphincter.

duced 1 cm. from the line of denudation, they pass parallel across the septum at the distance of about ½ cm. from each other, and appear on the opposite side of the perineum.

It is of great importance to pass the first suture in an exact manner, as it unites the severed ends of the sphincter and restores the anus as nearly as possible to its former condition. It should penetrate the bleeding surface very near its posterior border, and pass deeply in the angle of division of the septum, where it is to secure its supporting point. Generally five or six deep sutures are all that are necessary. If the region of the fourchette is not accurately ad-

justed, a superficial suture at this point will be necessary. The same is true if the skin flaps of the perineal incision are not brought into perfect apposition, when a few complementary sutures will be required superficially. The operation is terminated by a careful cleansing of the parts with an antiseptic solution, after which the dressing is applied.

As is evident from the preceding description, Emmet's procedure for complete rupture is a method of a single series of sutures, except in unusual cases. Here there is no rectal suture and no vaginal, all the stitches are passed on a single plane, from the skin through the recto-vaginal septum or the vaginal wall, thus producing a great simplification of the operation. But that is not the principal object. What was proposed, according to Emmet and Thomas, was to pass the lower suture in such a way that the extremities of the retracted sphincter

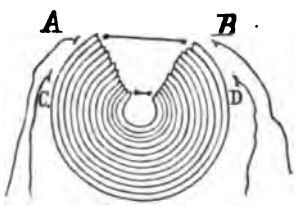


FIG. 121.—DIAGRAM OF THE SUTURE OF THE SPINCTER BY EMMET'S METHOD.

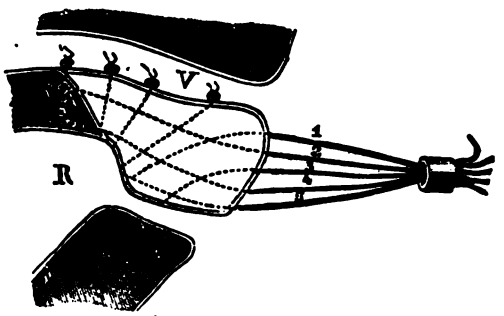


FIG. 122.—COMPLETE LACERATION OF THE PERINEUM AND THE RECTO-VAGINAL SEPTUM; PERINEORRHAPHY. Emmet's method. (Vertical section showing the plan of the sutures.)

would be drawn forward and the muscular ring restored to its normal form and function. However that may be, the application of this posterior suture demands careful attention. When the operation has been finished, the surgeon should pass his finger into the rectum to assure himself that this suture has not contracted the calibre of the rectum, for in that case there would not be an easy exit for the gas and fæces.

A great advantage of this method is that, by closing the defect in the recto-vaginal wall by a constricting suture, the solution of continuity is obliterated as one shuts a purse by drawing its strings; and as the septum is brought lower, the isolated suture of the vagina may be dispensed with. Thus is realized the exact occlusion of the vaginal wound and the protection of the line of union which Lan-

genbeck endeavored to obtain by his autoplastic flap, and the absence of the rectal suture diminishes the risk of infection.

If a very high division of the septum renders its suture necessary, Emmet freshens only the vaginal surface of this laceration, and passes his sutures under the bleeding area in its whole extent, avoiding the intestinal canal, fastening them by leaden shot in the interior of the vagina (Fig. 122). But this supplementary operation is seldom necessary, and the type of the method remains that of the single perineal suture.

Lawson Tait's Method.—This procedure differs but little from that applied to partial lacerations (page 363). The surgeon begins by

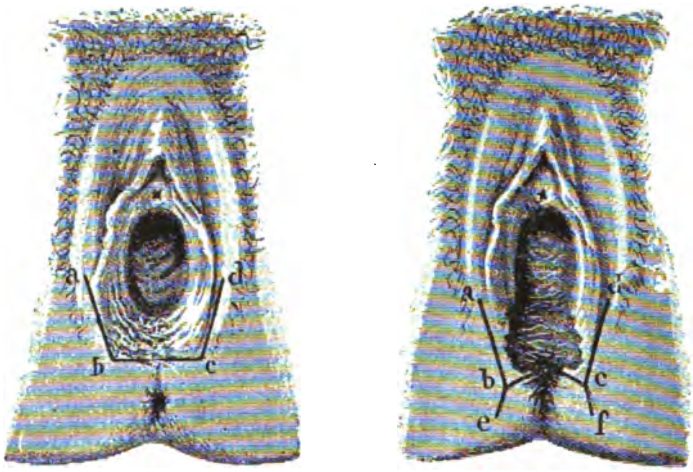


FIG. 123.—LACERATION OF THE PERINEUM; PERINEORRHAPHY. Lawson Tait's method. *a b c d*, Line of incision for incomplete laceration; *a b c d e f*, line of incision for complete laceration.

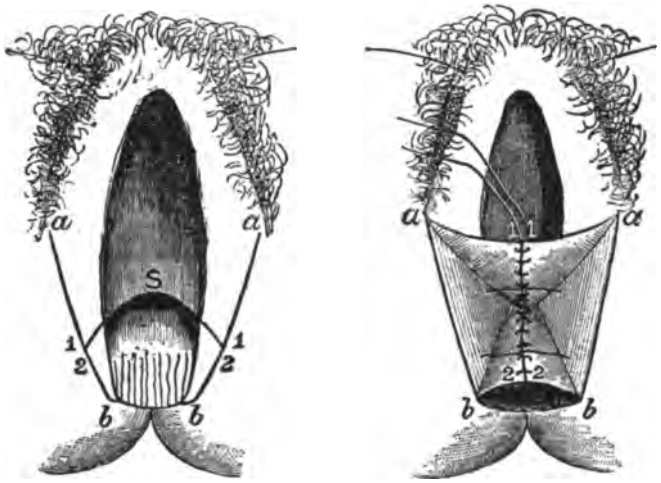
splitting the recto-vaginal septum and thus forming a rectal and a vaginal flap, the extent of this depending on the size of the laceration; according to Sänger, it is best made with the bistoury. Laterally this division of the septum is carried to the vertical lines which unite the labia minora to the labia majora, which is sufficient in partial laceration; and to these lines a posterior incision may be added which with them produces a figure like the letter "H," the transverse bar which joins the two sides being nearer to the lower part of the letter (Fig. 123). On these lateral portions the bistoury may be replaced by the scissors. Then the vaginal flap of the septum is carried upward and the rectal downward, so that the mucous surfaces may be carefully liberated by the scissors between the angles of the lines of section.

FLAP-SPLITTING OPERATION
FOR COMPLETE PERINEAL LACERATION

LINDNER, EDDY & CLAUSS, LITH N. Y.

The two flaps, vaginal and rectal, when they are separated, form a quadrilateral, at the bottom of which is the intact portion of the septum (see Plate III.); laterally they are attached to the soft parts by a thick margin, which must be divided. The transverse division of the septum is accomplished when the bistoury passes deeply inward to cut the lateral portions, whose section should be thorough.

Great care should be employed in placing the first suture to see that it traverses the ends of the sphincter, whose situation may be recognized before the denudation by the small dimple on each side of the cicatrix. This suture is made by Tait and Mundé of silkworm gut, but by Sänger of silver, as in partial laceration. All the sutures



FIGS. 124 AND 125.—COMPLETE LACERATION OF THE PERINEUM; PERINEORRHAPHY. Simpson's method; vivification; sutures.

appear on the perineum and none are tied in the rectum. Tait does not include the skin in the deep series; Mundé advises to do so; Martin employs the continuous catgut suture on superposed planes.

Iodoform in powder is used for the dressing, and the sutures are removed on the seventh and fourteenth days.

Simpson's Method.—From the chronological standpoint this procedure should be described before the preceding, which it much anticipated; but as it is less important, I will treat it as an appendix. It resembles Tait's in the manner of denuding the tissues, but differs from it in the sutures; my description is taken from Hart and Barbour.[46]

The first incision starts from the end of the recto-vaginal septum, enters both rectum and vagina, follows the internal face of the labium

majus from within outward, and emerges at the point 1; another incision is made from the point *a*, parallel to the orifice of the vulva, passing by the external extremity of the first incision and stopping at *b*, at the end of the sphincter. This is repeated on the other side. The two triangular flaps thus obtained are dissected (Fig. 125); the flap *a*IS is lifted forward on each side, so that the angles marked I in the first figure reunite with each other in the second. The vaginal flaps are sutured with silver or silk, taking care to tie them on the vaginal surface; the ends are left long, and hang out of the vagina. In the rectum it is better to employ catgut and cut the ends short.

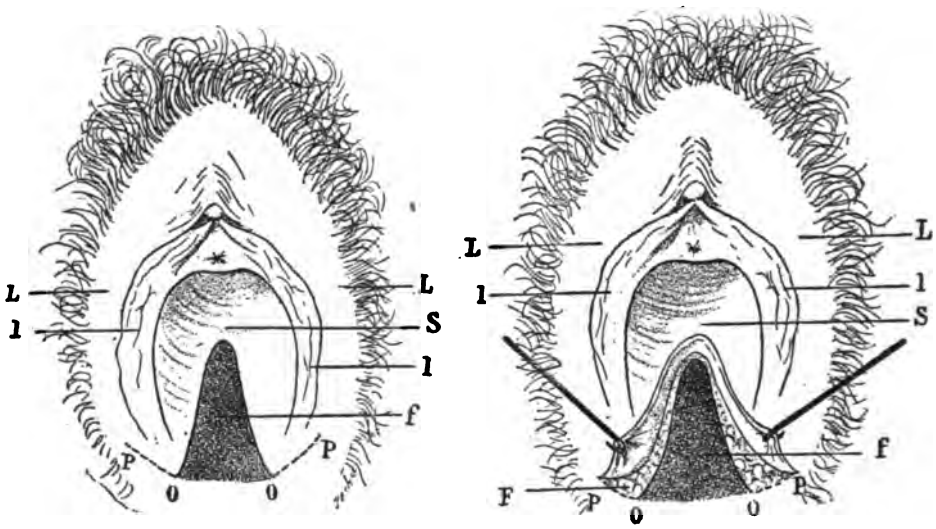


FIG. 125.—LACERATION OF THE RECTO-VAGINAL SEPTUM; METHOD OF SPLITTING (FRITSCH-WALDEYER). S, Recto-vaginal septum; *f*, laceration of the same; L, labium majus; *l*, labium minus; P, perineum; F, rectal portion of the septum.

To close the bleeding cavity which results, two deep perineal sutures are passed, and tied over metal plates. A few superficial stitches complete the operation.

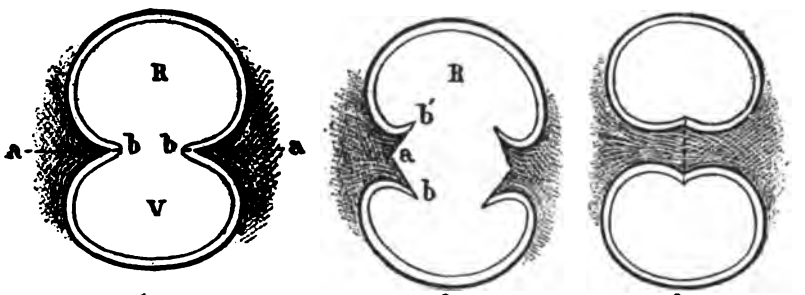
Fritsch's Method.[47]—This procedure still more closely resembles Tait's, and like it is based on the principle of splitting the septum, instead of denuding the tissues, with the object of avoiding the formation of new cicatricial tissue. Fritsch detaches the rectum from the vagina in the partial lacerations, and adds to this a lateral incision for the sphincter when its ends are retracted; he unites these by a provisional stitch, which serves during the operation to restore the shape of the orifice and permit the regular process of reunion. He then sutures the rectal mucous membrane with separate catgut points

placed in the vagina and tied at the bottom of the wound. To avoid infection of the wound, according to Lauenstein's teaching, these sutures should not penetrate the rectum. The same sutures close the vagina without penetrating it. The perineum is then completed by a series of buried sutures on superposed planes, which Fritsch prefers to the continuous catgut suture in terraces.

If the laceration of the septum extend very far upward, it may be necessary to split it and suture it according to Walzberg's[48] plan (Fig. 127).

After-Treatment.—The dressing includes great cleanliness and the local application of iodoform powder. It is well also to catheterize the patient for the first few days, to avoid having the vulva soiled.

A very important question is whether the patient shall be kept constipated during the first few days. It is certain that the contact



1 2 3

FIG. 127.—LACERATION OF THE RECTO-VAGINAL SEPTUM; METHOD OF SPLITTING (FRITSCH-WALZBERG). Diagram. R, Rectum; V, vagina; *a b b'*, incision; 1, incision; 2, division; 3, reunion.

of fecal matters will infect the wound, especially if the sutures traverse the mucous membrane; but, on the other hand, the passage of hardened masses is apt to tear the uniting surfaces apart. Constipation not only presents a mechanical danger, but is also harmful by the trouble which it causes in the general condition of the patient, thus interfering with the process of repair. It is well, I think, to put the patient on a fluid diet for the first week, and to administer a gentle laxative at about the fifth day. When one or two stools have been produced, no attempt should be made to excite others, and if the simple laxative effect has been exceeded, give a little opium; four days afterward a new evacuation may be provoked. During the first few days the patient is apt to be tormented by intestinal gas; if that is the case, a soft rubber tube is carefully passed into the rectum several times a day to the depth of three to four inches.

The thighs should be placed close together and lightly tied, and

the patient should not be allowed to assume the sitting posture before the third week. The greatest cleanliness must be maintained, the vulva and the perineum being washed after each act of micturition or defecation.

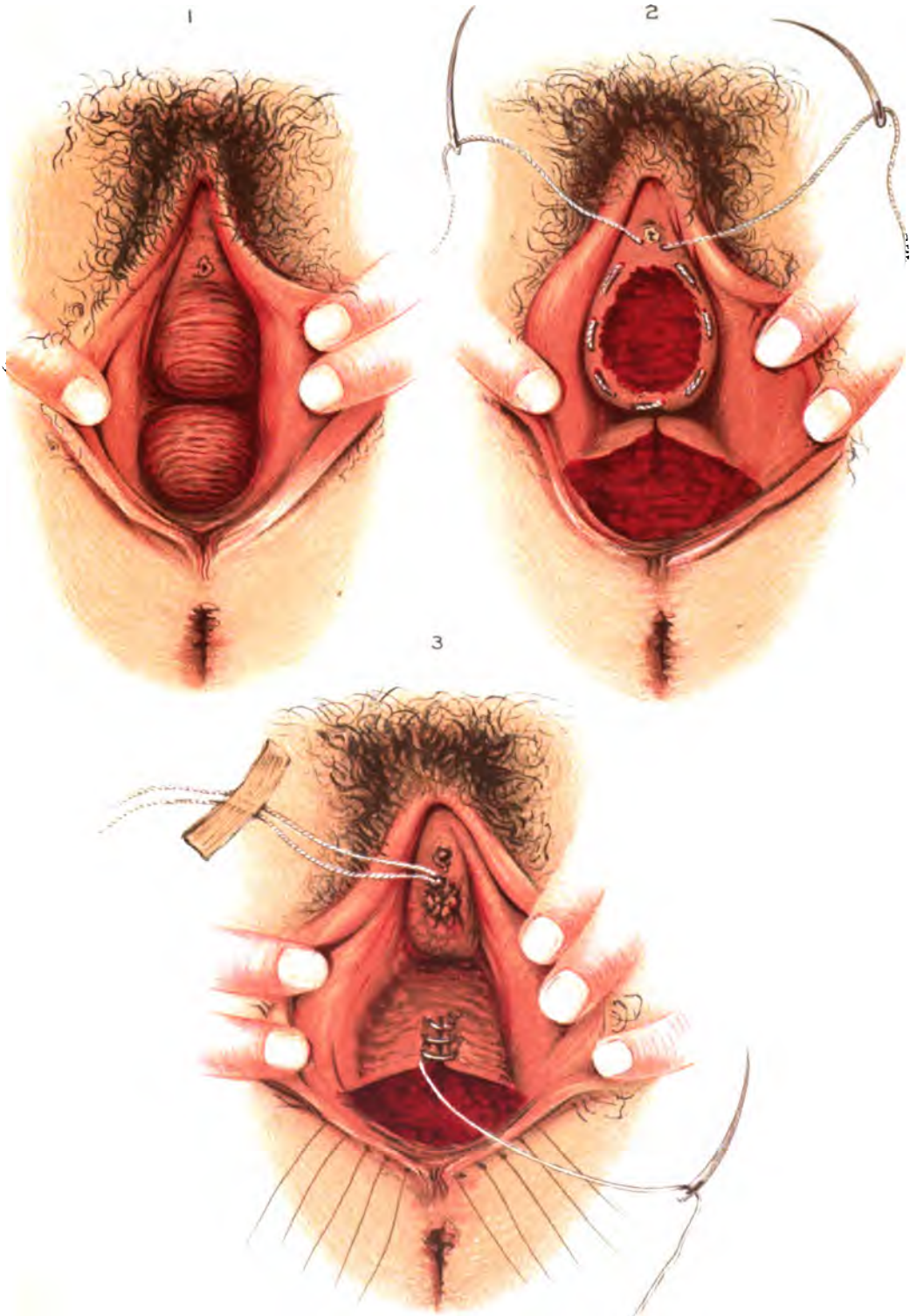
The temperature must also be carefully watched, fever announcing the infection of the wound or the formation of an abscess. This occurs when part of the wound surface has not been exactly coapted and there remains a dead space for the accumulation of blood or serum in the deeper portions of the perineum, which furnishes an excellent nidus for the development of bacteria introduced during an operation which was not sufficiently aseptic or along the sutures. The part then becomes tense, painful, and œdematous, and the sutures sink deeply into the swollen tissues. If not quickly relieved, the inflammation becomes more intense and causes the total disunion of the flaps; at times, by an opportune removal of one or two sutures, the inflammatory process may be limited to a small area and the disunion is only partial. If this occurs in the perineal aspect of the part, only a portion of the wound fails to unite by first intention; but if it involves the recto-vaginal septum, there is great danger of the formation of fistula. If the perforation is very small, it may be obliterated by the granulation with the aid of cauterization; but if it is more extensive, it persists, and necessitates a new operation, which should not be undertaken before a month after the perineorrhaphy. The pathognomonic symptom of this deep separation is incontinence of gas, complained of anew by the patient.

In general, the perineal sutures of silver, silkworm gut, or silk are removed on the tenth or twelfth day, when they begin to cut and irritate the tissues; if there is no sign of local inflammation, we may wait a little longer, especially when silver has been used. The vaginal sutures are removed the last; catgut may be left alone.

The patient may begin to walk at the end of two months, and the sexual relation be resumed at the end of six.

Prognosis and Results of Perineorrhaphy.—The operation is not really a grave one. There is no fear of great hemorrhage or of septicæmia; the cases of the latter complication are all, with rare exceptions, of very ancient date.

The results are also very much better since we ceased to fear suppuration. Before that, the absence of antiseptics and the multiplication of sutures in the rectum and the vagina made infection of the wound almost a certainty; and when the union was complete superfi-



STOLTZ'S OPERATION FOR CYSTOCELE.
HEGAR'S OPERATION FOR RECTOCELE.

LINDNER, LODY & CLAUSS, LITH. N. Y.

cially, there was often a cavity left more deeply, with a resulting recto-vaginal fistula. This accident has seldom happened since the employment of antiseptics and since more care has been taken in the apposition of the deeper parts, and since the sutures in the great majority of cases have been passed through the perineum entirely (Emmet's and Tait's methods).

Moreover, the care taken in the union of the deep muscular planes and in the junction of the divided ends of the sphincter has improved the results obtained as regards the function of the intestine. It was not uncommon to see women whose perinea had the appearance of being perfectly restored, and yet who had no power of retaining the gaseous and liquid contents of the intestine.

Many cases prove that parturition may be accomplished without the production of any new rupture of the perineum, even when the operator has diminished the size of the vulva considerably; this latter is an operative fault, and should be guarded against.

Choice of Method.—Each one of the procedures described has given good results, and they may therefore be said to be all good. But the preference should be given to the method which is most simple and rapid of execution. For this reason Tait's operation is much employed. It cannot be denied that it renders great service, but all other methods need not be abandoned for it. Many surgeons do not accept it for incomplete lacerations. The objection has beeen made that it creates a small cul-de-sac behind the fourchette. In the complete form of the deformity Tait's method has had far more successes, and many operators prefer it to the older procedures which they have tried. However, even in high laceration of the recto-vaginal septum, good results may be obtained by carrying the division much higher upward, as Walzberg has done, and suturing as the preliminary step. Often the perineorrhaphy should be preceded by curetting and an operation on the cervix for the accompanying metritis.

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CHAPTER XVIII.

INFLAMMATION, ŒDEMA, GANGRENE, ERYSIPELAS, ECZEMA, AND HERPES OF THE VULVA.

VULVITIS.—*Pathology.*—The vulva is formed of parts which are very distinct anatomically, comprising: Cutaneous folds, the labia majora; mucous folds, the labia minora and the hymen; and orifices of canals, the urinary meatus and the ducts of Bartholin's glands.

The inflammations which affect these various parts have very diverse characters, and the attempt has been made to indicate the chief differences by the use of the term sebaceous vulvitis for an inflammation which is localized in the integument, and mucous vulvitis where it is internal. But commonly all the parts found in this region are involved together by a diffuse inflammation. The sebaceous and sudoriparous glands in the skin are most frequently the starting-point for the inflammation of acne and furunculosis of the labia majora (Verneuil). On the other hand, the orifices of the excretory ducts of Bartholin, the mucous crypts which are found about the meatus and which Skene has described as glands, and the meatus itself are the principal foci for inflammation on the mucous surface. Inguinal adenitis is a frequent consequence of vulvitis of the cutaneous type. It is rarely seen unless in the puerperal state there has been suppuration of the labia majora in their loose cellular tissue; but it often attacks the vulvo-vaginal glands.

Symptoms.—A sharp local pain, which is increased by walking and the contact of the urine, is the first sign which the patient notices. A fairly abundant and at times fetid discharge bathes the region, irritates the internal surfaces of the thighs and, in children, the inter-gluteal fold. On the grayish floor of these erosions there may appear ganglionic engorgement which resembles syphilis. The mucous membrane of the labia minora and the fourchette is red and swollen; pus mingled with smegma accumulates between the labia; the latter become œdematous and present very small pustules at the bases of the hairs; the larger of these resemble furuncles, and circumscribed abscesses may result.

Huguier has described a cutaneous form of this affection under the name of vulvar folliculitis, which presents three periods—eruption, suppuration, and decline.[1] The affection may terminate by induration, the small tumor which results resembling sebaceous acne; this is the acne varioliforme of Bazin and the vulvar exdermoptosis of Huguier. The small buttons thus formed are of the size of a hempseed, and although indurated have no inflammation about them; the skin between is completely healthy.[2]

The intensity of the inflammation varies. When it is very acute, it may cause fever, and there is then usually a complicating lymphadenitis of the inguinal region, with suppuration. Probably it is to this lymphangitis that suppuration of the labium majus, or phlegmonous vulvitis has always been attributed; it is rarely observed. Inflammation of the meatus provokes dysuria. If the inflammation involves the glands of Bartholin, it is manifested by the tumor which forms, and the pus which may be expressed from its duct.

Diagnosis.—It is easy to recognize vulvitis, but the important point is to determine the complications of the urethra, the vulvo-vaginal glands, and the vagina.

The etiology is very obscure in certain cases. It must not be forgotten that, in lymphatic infants who are deprived of all hygienic care, a very intense vulvar catarrh may arise without any contagion, by simple decomposition of the smegma, and cause erosions and even ulceration. In a medico-legal examination, therefore, we should not too hastily assume either violation or contagion in the absence of other proof. Phlegmon of the labium majus may be distinguished from abscess of the vulvo-vaginal gland by the situation of the tumor and the fluctuation toward the external or cutaneous aspect of the part.

Etiology.—Of all the causes of vulvitis, the most frequent is certainly gonorrheal contagion. This is the cause even in those cases where we hesitate to make the assertion, as in the epidemics of vulvitis and vulvo-vaginitis which are observed where a number of children are herded together in boarding-houses and hospitals. For the details I refer to the chapter on vaginitis. There is no doubt, on the other hand, that saprogenic microbes may develop independently of the gonococcus in children and poorly nourished women, and cause attacks of vulvitis which might be termed sordid. Small lymphatic children and obese women are particularly disposed to this form, especially in the poorer classes. With children the oxyuris may also share in the production of the affection.

In the case of vesico-vaginal fistula, the incessant contact of the urine irritates the vulva and the internal surface of the thighs, but this chronic irritation does not cause hypersecretion, and resembles more closely chronic erythema of the parts than vulvitis.

Treatment.—In the acute stage baths, abundant lotion with boric-acid solution or white wash (Goulard's lotion), extreme cleanliness, and repose are to be recommended. If there is a suspicion that the inflammation is gonorrheal, painting with a weak solution of nitrate of silver may be employed (1: 50); this lessens the pain and is an excellent antiseptic. Lotions and injections of bichloride are also employed (1 : 5,000). The vulva may be powdered with talc to which has been added one-tenth part of iodoform. If the orifice of the vulvo-vaginal gland is inflamed, it should be cauterized with a nitrate-of-silver pencil after enlargement with Weber's small knife which is used for incision of the lachrymal ducts. If the crypts about the urethra seem to be the seat of the inflammation, they should be penetrated with a fine cautery point, or simple igni-puncture may be practised. Abscess and bubo should be at once opened.

ŒDEMA AND GANGRENE.—Localized œdema has been observed in the vulva during pregnancy, from the disturbance of the circulation in the lower pelvis and varix of the external pudic veins.

In the puerperal state, shortly after delivery, if there is œdema of one side of the vulva alone, it is a sure sign of infection from a laceration in the vagina or an eschar or a phlegmon.

In general anasarca, the labia majora, whose tissue is very lax and lamellated, may swell to an enormous size, rendering micturition or even the passage of a catheter difficult. Spontaneous fissures, or incisions made for the purpose, give issue to serous fluid, but are often the starting-points for erysipelas also.

In syphilitic affections of the vulva, especially in the case of infecting chancre, there is at times a hard œdema which attracts the attention of the patient more than the chancre, which is considered only an excoriation, of no importance. This œdema, which persists a long time after the ulcer has been cured, is often situated on the nymphæ, or the preputium clitoridis, which are transformed into sclerous hypertrophied tissue with the appearance of elephantiasis. In one such case I excised a tumor which had existed many months and had not been modified by the internal treatment. These are probably the cases which MacClintock describes as syphilitic hypertrophy of the vulva.[8]

Gangrene of the vulva[4] may be caused by traumatism during parturition, when to this local cause there is added the influence of a general infection, as puerperal fever. Other forms of septicæmia may have the same result; typhoid, scarlatina, variola, etc.

Weak and scrofulous infants have gangrene of the vulva as they have noma of the mouth; this may also be epidemic and fatal.

The treatment consists in maintaining the vagina aseptic and keeping its walls separated to prevent the formation of adhesions.

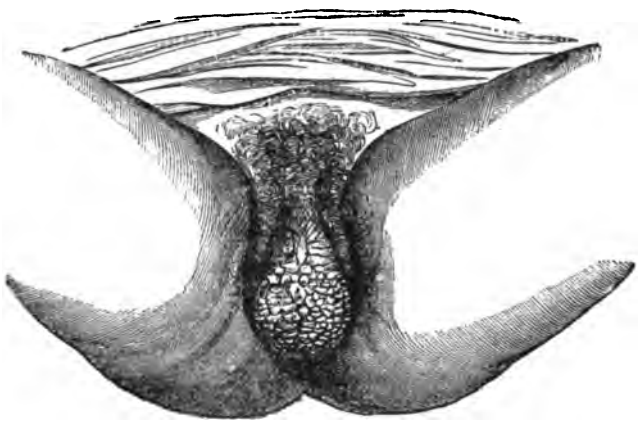

FIG. 128.—HARD HYPERTROPHIC ŒDEMA OF THE LEFT NYMPHA, FOLLOWING A SYPHILITIC LESION. MacClintock.

ERYSIPELAS.—Primary erysipelas of the vulva appears quite often in the new-born, just as it occurs also at the umbilicus; it is very serious and frequently ends in death.

In menstruating women there is often an attack of erysipelas which appears periodically at the time of the catamenia, and it has even been observed at the menstrual epoch in the absence of the flow, for which reason a supplementary character has been attributed to it.[5] It is probable that the microbes persist in the part, but are latent until aroused each month by the catamenial molimen.

As regards treatment, the local application of oxide of zinc in powder and bandaging with ethereal tincture of camphor, may give some relief. Hüter and Boeckel recommend the injection of one or two syringefuls of carbolic solution (2 or 3 in 100) hypodermically about the edges of the inflamed area, repeated night and morning Lücke prescribes friction with turpentine.[6]

ECZEMA.—This affection may occur on the labia majora or the mons veneris as an acute or chronic inflammation.

In the acute form its onset is sudden, manifested by heat and followed by swelling and an intensely red color. Small transparent vesicles form, of the size of the head of a pin, scattered over the skin, but at times they are difficult to distinguish, as the scratching removes them; to discover them, the skin should be inspected by oblique light. There is often some disturbance of the stomach and catarrhal fever. The eruption is produced in the rheumatic especially in spring. At the end of about a fortnight the acute stage is over, and the patient passes to the chronic stage.

Chronic eczema most often appears as eczema rubrum (Hebra). In the acute form it is chiefly the labia majora which are attacked, but from here the inflammation spreads to the thighs, the perineum, and the anus. The labia are swollen, the vulva is patulous, and, as it is bathed in pus, at the first sight it resembles gonorrhœal vulvitis. The heat and itching are intolerable; painful fissures are produced at the fourchette, anus, and genito-crural folds, and to the excoriation succeeds the formation of crusts.

According to Hebra, in the majority of these cases there are complicating menstrual troubles, and the same fact has been mentioned for herpes by Lagneau. The influence of diabetes mellitus has been suggested; that of the rheumatic diathesis is unquestionable.

The excoriations and fissures which follow chronic eczema must be distinguished from syphilitic lesions. Herpes differs in the disposition which presents toward the collection of large vesicles, and the derma is thicker in eczema. Simple pruritis vulvæ causes no eruption.

The treatment in the acute stage requires the application of poultices and frequent laxatives; spices and pork should be forbidden. In the chronic form, bichloride lotions (1 : 1,000) are advantageous, and also inunctions with the following:

℞	Iodoformi, ...	1.00 gm.
	Zinci oxidi, ...	2.00
	Lanolini, ...	30.00

M. ft. ungt.

The general treatment of the arthritic or scrofulous diathesis, or of diabetes if it be present, should not be neglected.

HERPES.—This affection is characterized by the formation of small transparent vesicles of the size of a pin's head to that of a pea, and either very few in number or multiple, from which fact it is divided

into discrete and confluent. A very rare form is solitary herpes (Fournier), which appears as a single erosion of large extent at times, resulting from the excoriation of a single group of vesicles.

At first herpes always causes a sensation of heat and smarting.

It begins as an area of redness either diffuse or confined to one spot, which soon covers itself with agminated vesicles; many of these patches fuse and produce a large pemphigoid bulla. When the vesicle is fully formed, it remains as a red or pale vesication, looking as if covered with a false membrane; the edges of the ulcer are scalloped; the whole is covered with a crust under which cicatrization goes on after eight to fifteen days. When this falls, the skin is rosy and turgid and sometimes resembles a syphilitic papule. The inguinal ganglia are often engorged, but they seldom suppurate. They are also painful, which distinguishes them from the subacute adenitis of syphilis.

Gastric disturbances occur with fever in the confluent form of the affection. The eruption usually appears two days before the menses. With some women this is repeated every month, and it often occurs in pregnancy. The congestion of the genital organs is then evidently the predisposing cause.

Any irritation of the vulva may produce an accidental herpes; such as gonorrhœal and syphilitic infection and neglect of ordinary cleanliness; the affection may also be constitutional, according to classic language; that is, caused by some trifling local irritation in a herpetic individual.

Diagnosis.—Fournier warns against confounding solitary herpes with chancre, and the ulcerations which follow discrete and confluent herpes with mucous placques. But the syphilitic chancre presents more of the character of an erosion than of an ulceration; its surface is smooth, varnished, and of a deep red color. Sometimes, however, its centre is slightly excavated; it is then called the ulcerative form. But in the erosive form the principal lesion seems to be constituted not so much by an actual loss of substance, as by the formation of a small indurated placque resembling parchment, which may be at once recognized by grasping it between the finger and the thumb, at a certain distance from the lesion and parallel with its surface. The indolent engorgement of the ganglia, in the form of the Pleiades, is characteristic, and there is neither itching nor smarting with chancre. The evolution of the herpetic lesions in a typical manner every eight to fifteen days, and the coexistence of other characteristic symptoms,

will also help to make the diagnosis evident; but in certain cases it may still be doubtful for a long time. Simple chancre may be confounded with confluent herpes. This affection is then always multiple, but the appearance of the syphilitic and the herpetic ulcers is not the same. The base of the sore is uneven, fissured, and of a greenish color; the edges are sharply punched, and the discharge is abundant and thick; bubo or suppurative adenitis is very frequent. Inoculation gives positive proof; but it is better not to employ this method of diagnosis, as it may give rise to accidents.

Syphilides of the vulva, which appear as papules, erosions, and ulcers, are generally disseminated, more abundant, and distributed over a larger surface than is the case in herpes. They should not be confounded: the erosive form alone presents no peculiar character and can be distinguished only by the other syphilitic symptoms; the ulcerative form presents ulcers with a circular outline, blended in places, coexisting with mucous patches in the mouth or about the anus and the spaces between the toes, with other lesions of syphilis; The papular form consists of a flattened plateau, of round or oval shape, coppery red in color, with a dry or ulcerated surface (the papulo-erosive form of Fournier). It is evident how such a lesion differs from herpes; it is also seldom localized to the vulva, but is scattered over the whole integument.

Herpes of the vulva cannot be inoculated.[7]

Treatment has for its object the calming of the pain by prolonged baths and by poultices; the ulcers are powdered with a mixture of equal parts of oxide of zinc, subnitrate of bismuth, and iodoform; they may also be touched with nitrate of silver solution (1 in 50). The predisposing diathesis should be treated at the same time, to avoid the return of the malady.

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CHAPTER XIX.

LUPUS (ESTHIOMENE) OF THE VULVA.

Definition.—The name of esthiomene (ἐσθιειν—to devour) or lupus of the vulva has retained since the days of Huguier,[1] who first described it, a purely clinical signification. It is applied to lesions of a variable nature which present the common characters of a tendency to hypertrophy and a slow ulceration which has a progressively de-

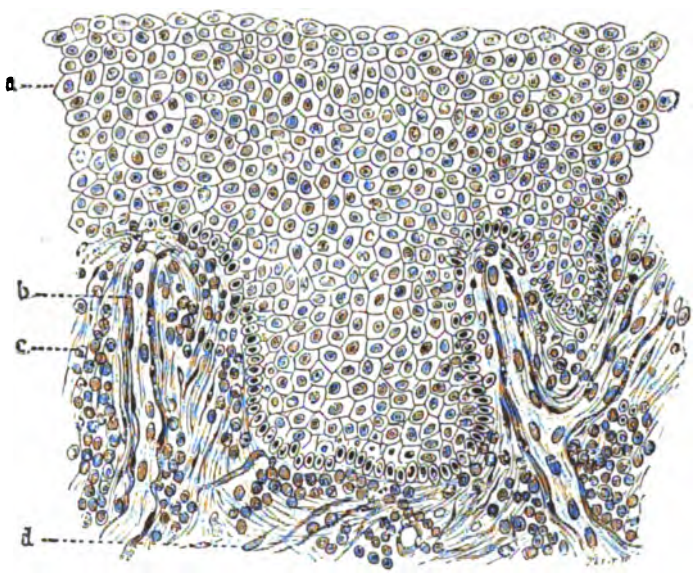

FIG. 129.—LUPUS OF THE VULVA (THIN). Section vertical to the external surface. *a*, Normal epithelium; *b*, blood-vessel; *c*, infiltration of small cells about the *d*, fusiform connective-tissue cells.

structive effect on the vulvar region. This affection has been justly compared to lupus of the face on account of its appearance and course; but the demonstration of the tuberculous nature, as in lupus of the face, has yet to be made for the vulvar affection.

Pathology.—As every ulceration whose borders had a tendency to hypertrophy has been called lupus, it is not astonishing that the most diverse histological changes have been encountered in this disease, comparable to elephantiasis at one time and to tubular epithe-

lioma (Cornil) at another.[2] Again, the only lesion found has been that of inflammation of the derma with an infiltration of embryonic cells into the connective tissue, especially about the vessels which were in a dilated condition[3] (Figs. 129 and 130).

Symptoms.—There are two clinical types, according as the ulceration or the hypertrophy predominates.

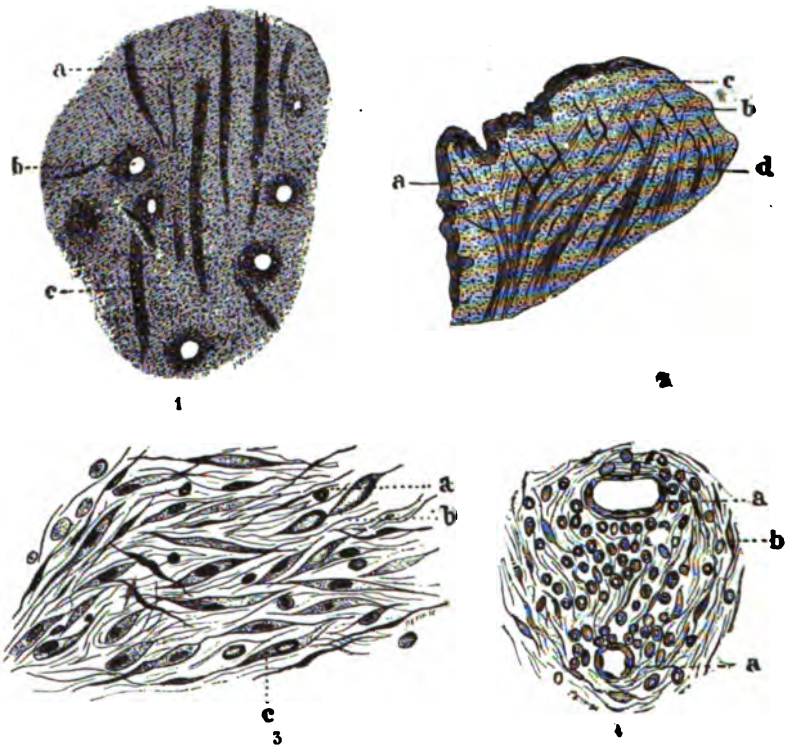

FIG. 130.—LUPUS OF THE VULVA (THIN). Section from a part where there were many vessels and much infiltration of small cells. No. 1. Low power. *a*, Small infiltrating cells; *b*, transverse section of a vessel showing perivascular infiltration; *c*, vessel seen longitudinally. No. 2. Section to show the numerous vessels directed toward the epithelium. (4 diameters.) *a*, Epithelium; *b*, blood-vessel; *c*, young connective tissue containing many cells; *d*, connective tissue which is further developed, showing fibres in fasciculi. No. 3. With higher power; *a*, leucocyte; *b*, forming fibrous tissue; *c*, flattened fusiform cell. No. 4. *a a*, Blood-vessel cut transversely; *b*, fusiform cell of the fibrous tissue in process of formation.

1. *Ulcerative Form.*—Several varieties have been described. Erythematous lupus is a very superficial ulceration, like the same variety on the face, with a livid red color; tuberculous lupus is constituted by a number of hypertrophied papillæ scattered over the base of the ulceration; the latter has its borders bevelled, and is of a violet color. One of the most important characters is the tendency to heal on one side while the ulceration progresses on the other; thus

the process of repair may build up a part several times, only to be broken down again. The ulceration is called serpiginous when it sends out prolongations toward the vestibule, and perforating when it produces deep excavations.

The discharge which comes from the ulcerations is not very abundant. Deep perforation and fistula of both rectum and bladder may be produced; and partial cicatrization of an ulcerated surface may cause retraction of the urinary meatus.

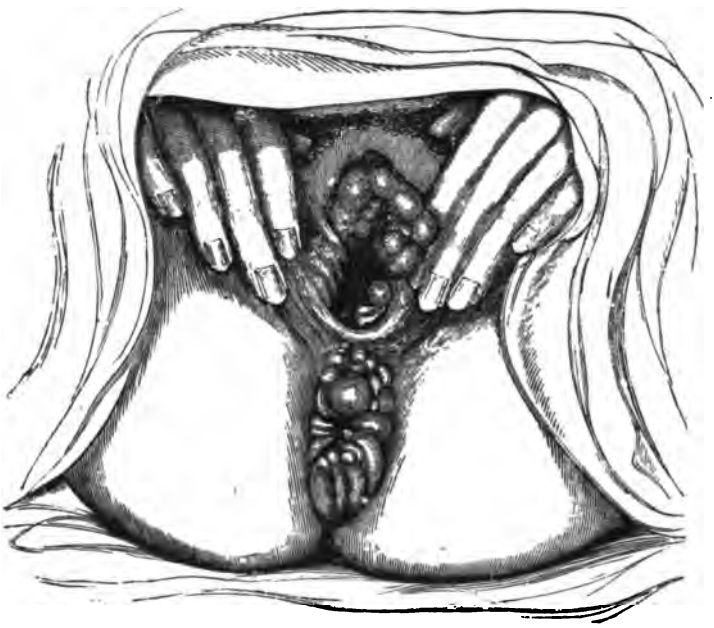

FIG. 131.—LUPUS OF THE VULVA (MACCLINTOCK).

2. *Hypertrophic Form.*—The hypertrophy, which is never absent even in the preceding form, assumes here very great importance; the nymphæ and the prepuce of the clitoris may become of double or triple their normal size, seeming to be infiltrated with œdema which gives them a firm and elastic consistency; in many other points in the adjacent skin there are tubercles or hypertrophic nodules which may invade the whole surface of the perineum; the surface is polished and glossy, of a red or violet color. In certain cases the hypertrophy of the labium majus reaches such a development that it suggests the idea of elephantiasis. These indurated parts are seldom painful, except when they are inflamed, while urethral caruncles are ordinarily very sensitive (Duncan).

These two forms are at times isolated, but usually they are found together.

Diagnosis.—The slow course of the affection, its accompanying hypertrophy, and the absence of any great engorgement of the ganglia serve to distinguish it from phagedænic chancre, tertiary syphilis, and cancer. It can be confounded with elephantiasis only where there is no marked induration of the tissues or spontaneous ulceration.

Prognosis.—The disease is a grave one, although it has such a slow course that it may progress eight or ten years. Death may occur from extension to the rectum or from peritonitis.

Etiology.—Lupus of the vulva is a rare affection. It is most often observed between the twentieth and the thirtieth year and in the lower classes, especially prostitutes. A predisposing cause of great importance is tuberculosis, of which it is often the cutaneous manifestation, although this has not yet been demonstrated anatomically. But it may be noted that two of Bernutz's patients, two of Fiquet's, and one of Le Fort's[4] had very evident tuberculous antecedents. Whatever causes an abnormal physiological condition, like privation, excess, hereditary syphilis, etc., predisposes to lupus.

Treatment.—This consists essentially in cauterization of the ulcers and excision of the hypertrophied portions. The actual cautery is preferable to potential cauteries, such as nitric acid (E. Martin), caustic potash (G. Veit), and sulphuric acid (Guillaumet). As to the scarification and scraping with the curette which have rendered such service in lupus of the face, they are of benefit here only in the erythematous form. Dressing with iodoform[5] and application of tincture of iodine have also been successful.

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CHAPTER XX.

TUMORS OF THE VULVA.

VARICOSE TUMORS.—During pregnancy it is not uncommon to see varices of the labium majus, which may reach a great size. Holden in one case found the labia majora of the size of the fœtal head; the patient died of phlebitis.

Usually such tumors produce only a feeling of discomfort and weight in walking. They are of a bluish color, which becomes violet on the mucous surface. When they rupture, under the effect of some effort, or from traumatism, or spontaneously, they cause serious [1] or fatal hemorrhage.[2]

The varicose region should be sustained and lightly compressed with a T-bandage. [The patient should also wear an abdominal corset to lift the uterus and lessen the pressure on the pelvic veins, and should dress loosely, and with no constriction about the waist.]

HÆMATOMA *or Thrombus.*—The subcutaneous rupture of a varicose vein, often unrecognized before the accident, causes thrombus of the vulva. It occurs usually during labor, after violent manœuvres, exaggerated efforts, or the sudden issue of the head. In the non-pregnant condition it has been observed as the result of a blow or a fall, and its dimensions are then very much smaller.

Most commonly but one labium is distended with blood; it then presents a violet color, and may assume the proportions of the fœtal head. It is a grave complication of parturition; in one hundred and twenty cases collected by Girard [3] there were twenty-four deaths.

The tumor thus formed may rupture and cause death, or suppurate and produce septicæmia. To avoid this complication the parts about the tumor should be incised, the cavity cleaned out, and, if necessary, a permanent forceps placed on the bleeding vessel, and the pouch stuffed with iodoform gauze. When, however, the tumor is very small, it may be trusted to nature to be absorbed, and all that is required is to keep the vagina aseptic.

SIMPLE VEGETATIONS.—This affection is also known under the name of papilloma or condyloma.

The tumor has the appearance of a cauliflower, at times very voluminous, formed by hypertrophy of the papillæ of the skin or vulvo-vaginal mucous membrane. As they are often isolated, they have received the name of "cock's combs"; when massed, they may be of the size of the fœtal head. Their color is either pale red or of a deep wine-tint; they are usually situated on the vulva, the perineum, or the margin of the anus, but may also occur in the vagina.

In the enormous mass which is formed by the junction of these vegetations we may distinguish groups of different orders separated

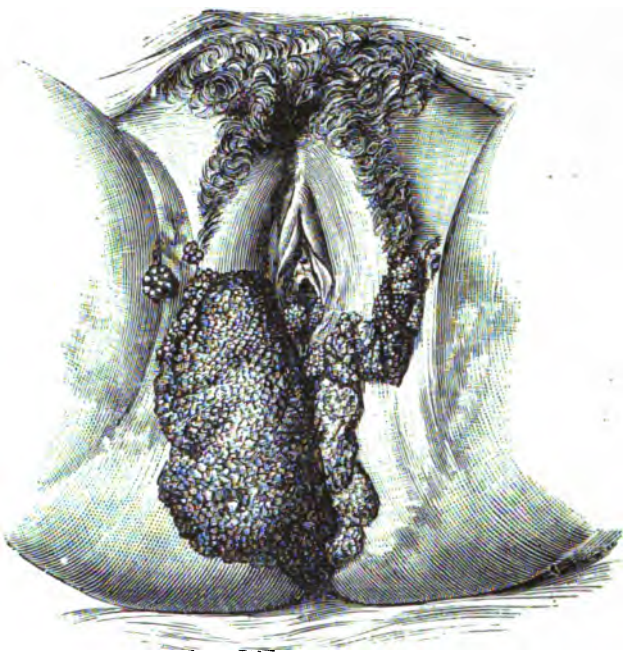

FIG. 132.—SIMPLE VEGETATIONS OF THE VULVA (TARNIER).

by furrows more or less deep. They are accompanied by a sanious and fetid discharge, and the irritation of walking may inflame them and render them painful. The fissures which are produced at their base sometimes become the seat of hyperæsthesia.

These vegetations have for a long time been considered as a reliable index of venereal infection, either gonorrhœal or syphilitic. There is no doubt that they are often caused by the irritation of a gonorrhœal discharge or the oozing of mucous patches of the vulva, especially in women who neglect the ordinary cleanliness of the parts. But the cock's comb formation may also be observed in pregnant women

No.1.

No.2.

FIBROMATA OF LABIA MINORA

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attacked by simple leucorrhœa; they seem to be the result of sordid irritation of the papillæ rather than of the contamination of a virus.

Their transmission by contact has been demonstrated.[4]

Treatment.—The best and most simple treatment is excision with the scissors, under continuous irrigation, followed by cauterization of their bases with the thermo-cautery, and a hem suture of the linear wound. This operation may be performed without pain by the use of cocaine, and may be divided over several sessions if the tumor is of large size. There is no need of hesitation in operating during pregnancy, for the traumatism is unimportant, and it is very necessary that the genital canal should present no source of infection at the moment of parturition. Zweifel has described a case in his practice where fatal suppuration in the pelvis took its origin from condylomata of the vulva, causing infection of a laceration of the vagina which had occurred during labor.

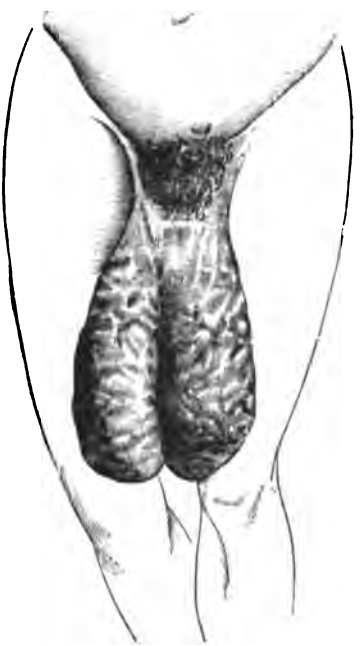

FIG. 133.—ELEPHANTIASIS OF THE VULVA.

ELEPHANTIASIS ARABUM (which must not be confounded with elephantiasis Græcorum) is caused by hyperplasia of the skin and subcutaneous cellular tissue. It is most common on the lower extremity (95%) and takes its name from the resulting resemblance to the foot of the elephant. It is also seen in men involving the penis and scrotum, and in women upon the labia and clitoris. It is a rare affection in our climate.

Pathology.—The largely hypertrophied labia majora form voluminous masses which may exceed the dimensions of the adult head and the weight of ten kilograms (4½ lb.). Their base is often broad, but at other times there is a pedicle and the tumor takes on the apppearance which the older writers described as molluscum pendulosum—a clinical term which comprehends all forms of tumor of the integument, whether elephantiasis, lipoma, fibroma, or myxoma. Many of the cases published as elephantiasis with a normal skin seem to me explicable by this confusion.

According to Cornil and Ranvier, there are histologically three principal forms of elephantiasis of the vulva:

1. In the first the entire derma is hypertrophied and returns to the embryonic condition. In the midst of this transformed tissue there are vast dilatations of the lymph spaces, comparable to those which are found in lymphangioma.

2. In the second form, which often succeeds to repeated œdema, the engorgement of the tissues extends over a large area, there is a stagnation of the lymph in the capillaries, larger trunks, and lacunæ of the lymph system; and particularly in this variety, the ganglia become the seat of fibrous alteration.

3. The third variety is chiefly remarkable for the enormous increase in the thickness of the derma. There is an abundant proliferation of all the elements of the derma, involving the connective tissue, the elastic fibres, and the smooth muscular cells, and, as in the other two forms, the lymph spaces are notably dilated. The obliteration of the lymphatics by proliferation of the endothelium has also been described. Certain pathologists have considered that the stagnation of the lymph, and its great abundance, play an important part in the pathogeny of the affection, as if it caused hypertrophy of the elements which it bathed. However that may be, there is no doubt that, in whatever form we consider it, the constant and predominant lesion is a wide dilatation of the lymph-vessels.

Symptoms.—The principal symptom is the tumefaction, which may reach such a degree that both walking and urination are interfered with. Ulceration may also be produced by friction, but the ulcers have a natural tendency to heal. The thickening of the tissues may invade the entire vulvar, perineal, and anal regions, and form enormous tumors, but usually without pain. Amenorrhœa is often observed.

The elephantiasis is called glabrous when the skin is smooth, verrucous when it is covered with warty projections, papillomatous when the papillæ are very much hypertrophied, hard when its consistency is firm, and soft when it yields to pressure, leaving an indentation as in œdema.

Diagnosis.— There are no great difficulties in determining the nature of the affection; the hypertrophic tumefaction of lupus always accompanies ulceration, and is confined within very narrow limits. Papillary vegetations are situated on the skin, while the thickening of elephantiasis involves also the framework of the derma. Pedicled fibromata and myxomata, which are sometimes called elephantiasis by an abuse of language, are always isolated and circumscribed tumors, while elephantiasis is essentially diffuse.

Etiology.—This affection is very rare in our climate, but is common in the Antilles and particularly in Barbadoes. In these countries the period of onset is often marked by acute lymphangitis and intense fever. Traumatism has been observed in some cases (Verneuil).

Treatment.—The only rational treatment is ablation with the bistoury, which I prefer to either écraseur or thermo- or galvano-cautery. Care must be taken to have the wound unite by first intention, as suppuration would here be peculiarly dangerous, on account of the number of the lymphatics and their great dilatation.

FIBROMA — *Fibromyoma* — *Myxoma.*— These tumors ordinarily occur in the labium majus, although they may be found in the nymphæ or the perineum. They are made up of fibrous tissue alone or in varying proportions with smooth muscular fibres or myxomatous tissue. They are at times of a soft consistency, forming when they are large one of the varieties of molluscum pendulum (Wilan [5]), or what has recently been described as molluscum simplex.[6]

These tumors are benign and of slow course; they may be enucleated or their pedicles may be cut, without danger of hemorrhage.

LIPOMA.—Lipoma of the vulva arises in the fatty tissue of the mons veneris, and may reach such a development that it appears more like elephantiasis. Stiegele [7] operated on one which weighed ten pounds; in one of Bruntzel's [8] cases the tumor increased greatly in size during pregnancy.

On section of the tumor, it is seen to be made up of lobuli, traversed by strong bands of fibrous tissue. The tumor is easily extirpated.

ENCHONDROMA.—Enchondroma of the vulvar region is a pathological curiosity. Cartilaginous tumors of the clitoris have been seen as large as the fist, furnished with a pedicle and presenting portions which were calcified (Schneevogt).[9] A case of pretended ossification of the clitoris reported by Beigel [10] is of this class, and also the curious case of Bartholin, so often cited, of the Venice courtesan who wounded her paramours with her ossified clitoris.[11]

NEUROMA.—I have found only two cases of this tumor in medical literature. One was a case of Simpson's,[12] where there was a painful nodule near the urinary meatus; the other is reported by Kennedy,[13] where there were tubercles which could be appreciated by touch, but could not be seen by a magnifying glass; this latter case is not indisputable.

CYSTS OF THE VULVA.—I will describe the cysts of Bartholin's

glands, which are the most frequent tumors of this class, in a later section.

Besides those of Bartholin's glands, cysts occur in other ways on different portions of the vulva.

A. *In the Labia Majora.*—Superficially, sebaceous cysts are found; Winckel operated on one which was of the size of an egg.[14]

More deeply, serous cysts occur, which according to many authors are encysted hydrocele of the round ligament, and which Duplay [15] declares to be almost always sacculated cysts developed in the sac of an old hernia. Blood cysts have also been observed in the greater labia, which by their position at the upper portion of the fold are very distinct from cysts of Bartholin's glands, of which I shall speak later. They are due, according to Koppe,[16] to hæmatocele in the interior of the terminal portion of the round ligament. Weber [17] has demonstrated that in the embryo this cord is hollow, and that the cavity may persist abnormally in later life. Other authors consider the cysts, like serous collections, as always originating in the sac of an old hernia (see chapter on Tumors of the Round Ligament). In this region also cysts have been observed whose origin is very obscure; in structure they resemble ovarian cysts,[18] and the opinion has been advanced by Klob [19] that they develop about the seat of a thrombus or else by dilatation of lymph-vessels. Lastly, there are many cases where the cyst contains epidermic structures, hair, teeth, etc.—the so-called dermoid cyst.[20]

B. *In the Vestibule.*—Between the meatus and the clitoris small cysts have been seen of the volume of a bean, containing a yellow or greenish fluid, and invested with a layer of cylindrical epithelium; they probably come from the sebaceous glands.

C. *In the Urinary Meatus.*—Kocks [21] has described a cul-de-sac which corresponds to the terminal vestige of Gärtner's duct; the small cysts which are encountered in this situation may be derived from this structure. On the other hand, Skene [22] has found and described two glands between the mucous membrane and the muscular layer of the urethra whose excretory duct measures from 2 to 3 cm., and admits a No. 1 bougie and opens near the meatus; but whether a cyst may be formed in these glands is a question which needs further observation in order to decide it.

D. *In the hymen*, congenital cysts have been observed by Winckel [23] which are of very small size and contain the products of disintegration of the pavement epithelial cells. Döderlein considers that

II.

I.

CYSTIC TUMOR OF THE CLITORIS.

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they are due to the fusion of the two layers of the hymen, and has seen them in the process of formation, resembling a similar cystic development in the vagina.[24]

VASCULAR TUMORS OF THE URINARY MEATUS.—As I have endeavored to demonstrate,[25] the hymen is not an isolated structure, but only the greater portion of a hymeneal apparatus which comprises:

1. The masculine frænum vestibuli.
2. The ring inclosing the urinary meatus.
3. The hymen. If the meatus of a young girl is closely examined by drawing the hymen downward, the upward prolongation of this membrane is clearly seen to surround the external orifice of the urethra by a ring, which forms the superior portion of a figure of eight, of which the hymen forms the inferior and far larger part; this upper ring is surmounted by a thin vertical band, the masculine frænum, which starts from the meatus and loses itself in the upper third of the vestibule. This arrangement of the urethra in some women forms a decided projection, upon whose lower portion we may see a small tongue which lies detached within the urethra like a uvula. This appendage to the hymen is at times so distinct that it might be called a urethral hymen. Like the same structure in the vagina, it may be a continuous membrane, and cause imperforate urethra, or it may present an erectile structure which corresponds to its homology with the corpus spongiosum of the penis, of which the hymen represents the undeveloped matrix tissue, the fibro-elastic framework which has not become erectile. These considerations throw a certain light on the pathogeny of vascular tumors of the urethra and meatus.

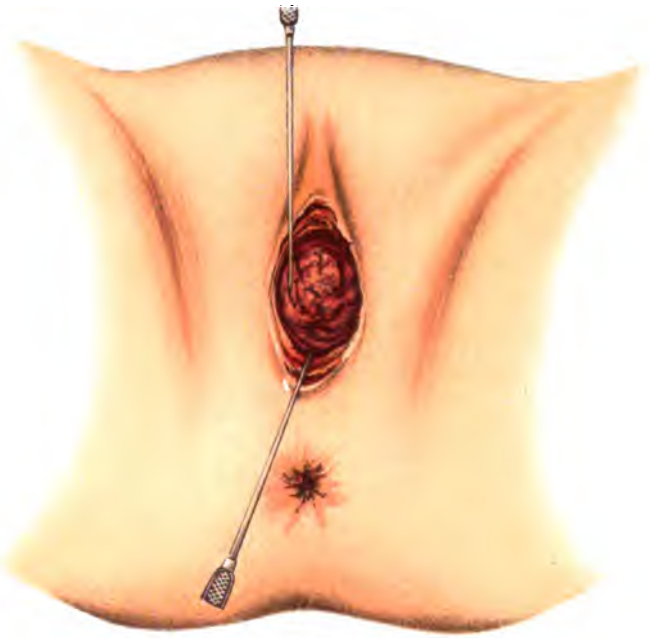
Pathology.—First described by Morgagni [26] and noted by Boyer [27] and other authors, these tumors, which are for the most part pedunculated and polypoid, have been for the first time made the subject of histological examination by G. Simon [28] and Verneuil.[29] The latter author has given them the name of papillary polyps and lays great stress upon their vascularity. To these tumors the term urethral hemorrhoids [30] has been applied, and Wedl [31] compares the vessels of the pathological tissue to the vasa vorticosa of the choroid. According to Virchow, the difference between these tumors and ordinary telangiectasis consists in the fact that the vessels are not dilated nor are their walls thickened. Jondeau [32] found, in two tumors of this class which he examined, connective tissue of the adult type mingled with elastic fibres, and between the trabeculæ were dilated vessels,

which had preserved their normal walls, and which formed by their frequent union veritable lacunæ. A section following the axis of the tumor divided nearly all these vessels obliquely, and some of them longitudinally, which demonstrated their general direction parallel to the axis of the pedicle. More deeply there succeeded to the adult connective tissue an embryonic tissue characterized by fine connective bands and fibres; here also and up to the periphery of the tumor there were dilated vessels, though of less volume, and not provided with a distinct wall. All about the circumference of the tumor there were hypertrophied papillæ covered with pavement epithelium, and apparently secondary or accessory in their formation. · In other words, the condition was that of an erectile tissue which in the male is normal, but of which the female is deprived; efforts of micturition had without doubt contributed to the development of the pedicle.

There are other cases where the tumor is formed more by the prolapse of the mucous membrane than by a definite polyp. I do not think that this prolapse is essentially different from the mode of origin of polypi, for they always coincide with a marked increase in the vascularity of the part; it is more a question of degrees, but the general relaxation of the mucous membrane due to idiosyncrasy or constitutional weakness plays here an important part.[33]

Etiology.—This affection is frequently met in little children; Larcher[34] and Dollez[35] have collected a number of such cases, and Benicke and Ruge[36] have observed it in patients of the age of seven to eleven years. But it is toward the period of middle life that these lesions are most commonly seen, though they may also be encountered in the aged; one of Trélat's patients was seventy-five years old. All the causes of local irritation of the meatus, or of congestion of the pelvic organs, or of inflammation of the urinary passages in adults, and debility or cachexia in children favor the production of these lesions.

Symptoms.—To bring these tumors well into view, the nymphæ must be separated and pressure made on the urethra by a finger in the vagina so that the small tumor which is hidden within the urethra will spring forward out of the meatus. Their size is variable, being as small as a pin's head or as large as a nut.[37] I have removed one from an old woman which had the appearance and volume of a raspberry. It is possible that the entire circumference of the meatus projects in a circular prolapse, like the condition of the rectal mucous membrane which is sometimes seen in hemorrhoids.



PROLAPSE OF THE URETHRA.

TRUE CYSTOCELE.

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The most frequent seat of the tumor is in the lower portion of the meatus, where is found the uvula which I have described as normal in some cases, and its insertion is apt to be broad; but it may be pedicled or constricted at the base. The color of these tumors is often violet or wine-color, and pressure turns them pale and also diminishes their volume. The surface is smooth, easily torn, and bleeds with great freedom. General prolapse forms a cylindrical tumor, which occupies the normal place of the meatus and presents at its end an opening which is at times difficult to discover; it is seldom reducible. (See Plate VIII.) These tumors cause pain spontaneously and at the moment of urination or coitus, and they may be the origin of vaginismus;[38] there are also occasionally crises of dysuria and retention by reflex action.

Diagnosis.—The painful nature of the complaint, in the absence of a local examination, would suggest either cystitis, vaginismus, or metritis. From the character of the tumor it is impossible to mistake it for epithelioma. Prolapse of the urethral membrane is not an essentially distinct lesion; it is the diffuse and less vascular form of the tumor whose circumscribed type is the polyp.[39]

Treatment.—When the tumor is well pedicled, its base may be ligated with an elastic band, and its mortification thus produced. But the simplest and least painful treatment is excision, with cauterization, after applying cocaine. When the thermo-cautery is employed, there is no need of fearing hemorrhage, which may be annoying if a cutting instrument is used. The meatus will not be abnormally contracted if we do not cauterize the entire circumference of its orifice, which is unnecessary even when the prolapse of the membrane occupies the whole of the opening. The ablation of two segments and their cauterization is sufficient, even in the latter case; hemorrhage is easily controlled by a catgut suture.

CANCER OF THE VULVA.—*Pathology.*—Primitive cancer of the vulva is rare, especially as compared with the same affection of the uterus. In 7,479 women who suffered with cancer, Gurtl[40] found 72 cases of cancer of the vulva, about 1%; this proportion seems too large, for it is probable that many of these cancers were secondary.

Cancer of the external genitals in the female presents many histological and anatomical forms. Histologically there may be epithelioma, either pavement or tubular, or sarcoma with its variety melano-sarcoma. Topographically there are two types, according as the neoplasm is developed in the clitoris or nymphæ, forming the variety

known as cancer of the vestibule, or is situated about the urethra, infiltrating its tissues and giving rise to the peri-urethral variety.

Epithelioma presents no peculiar features histologically, and I refer to the chapter on Cancer of the Uterus for its description. It usually starts from the groove which separates the smaller from the greater labium; less often from the clitoris [41] and meatus,[42] under the form of nodules which are covered by thick layers of epithelium; these scales are of older date than the cancer, and are the result of psoriasis of the part which has favored the development of the epithelioma. L. Mayer has reported several cases, and since then others have been observed.[43] Later in the course of the disease the nodules ulcerate and invade the adjacent parts, but there is no tendency to involve the vagina except in the case of cancer starting at the urinary meatus, which may be propagated along this canal and so attack the anterior vaginal wall; the inguinal ganglia are rapidly engorged.

Sarcoma of the vulva may exist in the simple form (Mayer), but it is more common to find it as melano-sarcoma.[44] In a case reported by Taylor, the small fusiform cells were filled with a brownish pig ment; in one of Terrillon's, the cells were round and pigmented, and both in the blood and in the urine there were dark granules to be discovered.

Etiology.—Cancer of the vulva is most frequent from forty to sixty years of age, but it has been observed much earlier. St. Germain [45] operated on a patient at the age of five, and Arnott reports one of twenty; on the other hand, there are many cases known in the very old.

I have already mentioned the predisposing influence of psoriasis. Hutchinson asserts that the lesions of a former syphilis have a positive etiological value, but this does not appear probable.

Symptoms.—The cancerous nodules may pass unnoticed for a long time, the only symptom being pruritus vulvæ, which is very severe, in some cases presenting crises when it torments the patient, interspersed with periods of calm. When the tumor becomes excoriated, there is a discharge of serous or bloody fluid with a fetid odor. The neoplasm at first resembles a wart of the size of a nut and is hard, mammillated, sessile, or furnished with a small pedicle. When the nodules become multiplied and confluent, the whole region takes on a wooden consistency, as in the case of scirrhous cancer of the breast; the vaginal orifice is contracted, and in the peri-urethral form the meatus is partly obliterated. By vaginal touch, the urethra is felt as

a hard cylinder. The ulceration has uneven borders covered with scales and crusts from the concretions of the discharge, and the adjacent skin is infiltrated and hard from œdema, presenting the appearance and consistency of orange peel; the pubic hair may fall out completely, and thus the vulva becomes entirely smooth. The secretion is serous or purulent; hemorrhage is rare. The ganglia of the groin rapidly swell and show all the signs of cancerous infection; from here the disease may become general, and death is hastened by some complication, as phlebitis or pleurisy. The vagina, the rectum, and the bladder are finally involved, and the pain caused by inflammation of these parts is then very severe.

Course—Progress.—The latent period of simple pruritus may be quite long, but as soon as the ulceration is established the various accidents succeed each other very rapidly; in melano-sarcoma the course is a little slower. In general, death occurs by the end of the second or third year. Cases where the patient has lived from ten to twenty years are of doubtful diagnosis (Deschamps [46]). Cornil's case where the tumor was a tubular epithelioma and a portion of it was eliminated, and the loss of tissue restored by a cicatrix, seems to belong to the class of lupus of the vulva, although the histological characters were those of epithelioma.[47]

Diagnosis.—Papillary vegetations of the vulva do not resemble cancer in the least, and in the case of polyp of the meatus the absence of ulceration would be a certain criterion.

Chancre occurs as a superficial ulceration or as an eroded and slightly projecting papule with very little discharge; and the early swelling of the ganglia in the characteristic form, together with other specific manifestations, will render the diagnosis clear.

Syphilitic papulo-erosions are multiple, flattened, and form a kind of rounded plateau looking like a small pastil placed upon the skin [48] and varying in size from that of a pea to that of a franc piece; the surface is denuded, moist, and secreting like a blistered part; and under the influence of local and general treatment they disappear rapidly—a circumstance which may be used to distinguish them in doubtful cases.

When the papules are confluent, they may form plates of from 6 to 8 cm. in diameter, covering the whole vulvar region and encroaching upon the perineum. At first sight this lesion appears like that of total infiltration of the derma with cancerous process as in the so-called "cancer en cuirasse," but attentive examination will quickly

demonstrate the peculiar characters of the syphilitic papule. The enormous vegetations of hypertrophic papular syphilide (Fournier) have a malignant appearance only to the inexperienced.

Chancroid has an acute course without induration, is surrounded by healthy skin, and the ulceration is made up of many little sores in various degrees of development; for, according to the picturesque expression of Ricord, "the soft chancre lives with its family, surrounded by offspring."

Lupus presents the double characters of ulceration and hypertrophy, the latter often being the more prominent. This affection is also of an uncertain course with alternate destruction and repair, the edges of the ulceration being marked by cicatrices and bridles. Its contour, moreover, is sinuous: it is disposed on different levels with a tendency to invade the perineum and groin, and often at the bottom of the fissures a red, pink, or yellow base can be seen covered with cicatricial cuticle. Nothing like this is to be observed in cancer, whose course is continuous and destructive, and the ganglia, which are not involved in lupus, are here rapidly invaded.

Treatment.—Complete extirpation of the diseased part is the only means of arresting its course, and this ablation it has been advised to make with the thermo-cautery to avoid hemorrhage; but by proceeding rapidly with the bistoury and the scissors the loss of blood is very small, and we obtain a wound which will unite by first intention when sutured. In one case I thus procured primary union over a large surface after dissecting off a cancer which had destroyed the vestibule and the greater portion of the nymphæ. Especial care must be taken to restore the meatus by exact apposition of the mucous membrane. Where the cancer is peri-urethral, a sound introduced into the bladder will assist in the dissection, and it may be necessary to follow the neoplasm up to the neck of that organ. If the inguinal ganglia are involved, they should also be extirpated, but we are not able to postpone the recurrence of the disease for a very long time. Where ablation would expose too large a surface, we must have recourse to palliative measures. The symptoms which especially disturb the patient should be attacked, such as the ichorous discharge, the fetid odor, and the irritation of adjacent parts. Frequent application of antiseptic fluid should be made, and iodoform gauze packed into the ulcerations and frequently renewed. Borated vaselin should be applied to the groin and the inner surface of the thighs to prevent the erythema which is caused by the irritating leucorrhœa. In certain

1 EPITHELIOMA OF LABIUM MAJUS.
2 EPITHELIOMA OF VAGINA.

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cases we may employ the method proposed by Kraske,[49] who suggested covering the ulcerated surface with healthy skin, to render the course of the disease slower and the symptoms less painful. For this purpose the part to be treated should be first scraped carefully, and then the flaps of healthy skin swung over and applied to the denuded surface.

[TUMORS OF THE CLITORIS are extremely rare. They may be the result of simple hypertrophy, elephantiasis, or other benign growths, or of malignant degeneration. The study of their pathology and histology is very incomplete. In most of the cases noted the growth has followed syphilitic infection or eczematous or other chronic inflammatory conditions of the adjacent tissues. The tumors are often accompanied by warty excrescences and vegetations, are usually pedunculated, are accompanied by singularly insignificant symptoms, and, except where carcinomatous, seldom recur after removal by surgical measures.[50]]

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CHAPTER XXI.

INFLAMMATION AND CYSTS OF BARTHOLIN'S GLANDS.

Etiology and Pathogeny.—The glands of Bartholin,[1] which Huguier proposed to call the vulvo-vaginal, have also been termed Duverney's or Cowper's glands, and the latter name has the advantage of suggesting their analogy with similar structures in the male. They are of the size of a bean and are situated deeply on the internal aspect of the labium majus, where they may be felt in a thin patient. The excretory duct is about 2 cm. in length and opens immediately in front of the hymen near the middle of the side of the vulva, and it admits the point of a Pravaz syringe.

The pathology of these glands may be almost said to have been created by Huguier.[2] Since his time but little has been added to the descriptions which he gave, but we have learned that nearly all the lesions of the part, whether cysts or inflammation, are due to one great cause, namely, gonorrhœa. Breton[4] was the first to demonstrate that this malady might remain for a long time dormant in the excretory duct of the gland after the vagina was free from it, and, starting from this point, renew its infection; Zeissl[5] confirmed these statements. Suppuration of the duct is the rule in vaginitis, as is easily seen by pressing on the part after carefully cleaning it and thus obtaining a drop of pus from the opening of the gland, which is surrounded by a purple-red areola, which resembles a flea-bite and has been called the gonorrhœal macule by Sänger. To cure this inflammation, the duct should be opened with a Weber knife such as is used in division of the lachrymal puncta, following it with the nitrate of silver crayon or a weak solution of chloride of zinc (1 in 50).

The intense infection which is propagated to the entire gland or some of its acini causes abscess; the obliteration or constriction of the duct produces cysts, among which are distinguished, arbitrarily and without anatomical proof, cyst of the duct, which is superficial, small and transparent, and cysts of the gland. These expressions are no more justifiable than that of abscess of the duct applied to

simple suppuration of the canal, which I have mentioned as the initial lesion in this group.

Cysts.—Symptoms.—The cyst may be single or multilocular; that is, formed at the expense of the whole gland or of one of its lobules, the rest being pushed aside. Its form is ovoid and its surface smooth; it is seldom transparent. Its contents are viscous, colorless or yellow, or at times mixed with blood and of a chocolate hue; in size it may vary from a nut to an egg. The tumor is usually unilateral, and on the left side elongated in the axis of the greater lip, whose posterior portion it occupies nearer to the mucous than the cutaneous surface; on pressure it is elastic and compressible rather than fluctuating.

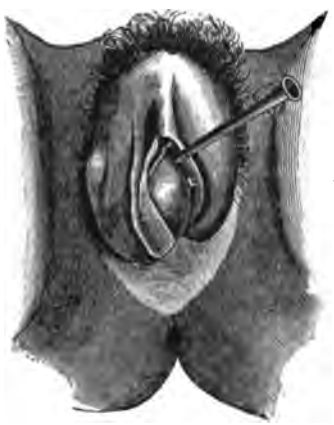

FIG. 134.—CYST OF BARTHOLIN'S GLAND. A sound has been passed into the urethra.

Cysts cause some discomfort in walking, but more in coitus, and they have a tendency to inflame and suppurate.

Since the time of Huguier all authors have distinguished two varieties—those of the duct and those of the gland proper. In the absence of any demonstrative dissection we ignore a distinction which refers to different parts of the gland in the production of the cyst, but clinically we know that there are two distinct types of the affection.

In the case of so-called cyst of the duct, which might better be termed the superficial variety, the tumor is generally very small, of the size of a nut, situated on the base of the labium minus, which it stretches out, making a projection in the vagina, and apparently placed directly under its mucous membrane, which glides freely over it; sometimes the tumor is transparent. The opening of the duct in certain cases remains pervious and a small stylet may be introduced or pressure may force out a little viscous fluid; it seems then that the alteration in the consistency of the excretion plays here the double rôle of temporarily obstructing the duct, and also of contracting it and thus producing the cyst.

In the case of cyst of the gland itself, which I prefer to call deep cyst, the tumor is large and is situated behind the labium majus, between the entrance of the vagina and the ascending ramus of the ischium, elevating both labia. The duct is not permeable, and the fluid contained is often discolored by old extravasation. The case

reported by Hoening,[6] where the tumor reached into the pelvis, appears to me to belong to cysts of the vagina rather than to those of the labium majus; it was undoubtedly of Wolffian origin, and, being developed at the entrance of the vulva, it projected into the greater labium.

Diagnosis.—Reducible tumors should be first eliminated, and we should determine whether we have a solid or a fluid swelling to deal with. Fluctuation and transparence are not sufficient to indicate the nature of the affection certainly, as in case of similar collections in the scrotum. Transparence is usually absent in deep cysts of the labium majus, and fluctuation may also be lacking if the tumor is very tense; or the partial softening of a solid tumor, as, for instance, a fibroma, may simulate it.[7] In doubtful cases, puncture with the aspirating needle will decide the question if we are unwilling to wait till the moment of exploratory incision, which constitutes the first step of the extirpation in any case. After ascertaining that the tumor is liquid, we should then determine its exact situation. Hydrocele in the female, or cyst of the labium majus apart from the vulvo-vaginal gland, which has given rise to so much theoretic discussion,[8] occupies the upper part of the labium; fluid collections, which may be either blood or serum, are reducible from the clinical standpoint to a few varieties, whose brief description will suffice to make clear the diagnosis (see the chapter on Tumors of the Round Ligament).

1. Small cysts of the size of an almond which enter and emerge from the more or less dilated inguinal canal, or even retire within the abdominal cavity under gentle pressure and come out as readily; sacculated cysts of old hernial sacs which have become obliterated and filled with fluid.

2. More voluminous cysts, not reducible, situated in the upper part of the labium majus, containing serum or a brownish fluid mixed with blood, which has given them the name of hæmatocele; at times furnished with a pedicle, which is continued into the inguinal canal. According to some authors, these are hydroceles of the canal of Nuck[9] or cysts arising in the thickness of the round ligament,[10] or sacculated cysts of old hernial sacs.

3. Occasionally a cyst may develop in front of a hernia which is retained by a truss, from the friction, but this clinical curiosity has nothing in common with the subject under discussion.

There remain the solid tumors, and among them the irreducible epiplocoeles, whose pasty consistency and lobulated form are easily

recognized. The best sign is furnished by the presence of a pedicle, which may be felt by drawing down the tumor as much as possible, and palpating at the external ring. If there is no sign of a connection at this point between the tumor and the contents of the abdomen, the case is not one of hernia; and the diagnosis will be confirmed if the impulse of coughing can be felt at the ring but not in the tumor. As to reducible enterocele, it is very rare in this region, and its sonorous percussion note is characteristic. A difficulty in diagnosis may be caused by the presence of fluid in the sac; and when there are both a hernia and a tumor of the labium majus in the same case, the diagnosis becomes enormously complicated. Ovarian hernia into the labium majus has been seen, although it is usually arrested at the level of the ring; the gland preserves its usual form and sensibility and pressure on the anterior face of the uterus causes a retraction of the tumor; but if there is a layer of fluid about an ovary which is atrophied and pressed against the wall of the sac, the case is very obscure.[11]

Treatment.—If the contents of the sac are merely emptied, they reappear very quickly, and consequently the cyst cavity should be modified in some way, for which purpose a number of methods have been proposed. The injection of from ten to twelve drops of chloride of zinc solution (1 in 10) with a Pravaz syringe, after aspiration of a quantity of the fluid equal to the amount injected, has been successful,[12] but the inflammation thus produced may be so extreme as to cause suppuration. Free incision followed by tamponing with iodoform gauze until the cyst wall exfoliates is a very sure method, but also very long. Extirpation of the cyst with immediate suture of the wound is to be preferred. To facilitate the dissection, which is rendered very difficult as soon as the cyst is opened, I apply to the operation my procedure of injecting spermaceti.[13] The cyst is first punctured with a trocar as in the case of hydrocele, washed with hot water, and the melted paraffin introduced at a low temperature. When the cavity is distended, ice is applied, and at the end of a few minutes we obtain a mass which is very easily extirpated with the anæsthesia of the cold and cocaine if necessary.

Abscess.—Symptoms.—Suppuration of Bartholin's glands may supervene after inflammation of a cyst or originate *de novo*. The swelling and peripheral œdema are considerable and extend over the posterior portion of the vulva or even to the anus; the pain is acute, lancinating; and there is always a certain degree of fever and at times

retention of urine. The fluctuation is apparent first on the inner surface of the labium majus, and the purulent matter is voided by one or many openings situated below the orifice of the duct. The pus is abundant and fetid as is usual in the neighborhood of the natural canals, and the presence of the gonococcus may often be determined. The fistulæ persist for a long time after the inflammation has disappeared, communicating with distinct foci which correspond to the different lobules of the gland (Huguier's "abcès granuleux"). But more often the whole of the gland and the adjacent tissues are involved by the suppuration (Huguier's "abcès parenchymateux"), and the many fistulæ which result open into a common cavity. Exceptionally they open on the perineum or into the rectum, giving rise to recto-vulvar fistulæ.[14] If the integument has been destroyed, there is a vast ulcerating surface on the inner aspect of the labium.

To the acute form the chronic may succeed; it is clinically distinct from the other, and has been well described by Hamonic[15] and Fauvel[16] as an obstinate seat of gonorrhœa. Huguier has applied the term of purulent hypersecretion to this condition. There are no signs of inflammation, no tumor, but only a simple hypertrophic induration of the gland, whose duct gives vent on pressure to a milky or greenish pus, which also escapes spontaneously by the fistulous openings. It is the last refuge of the gonorrhœal inflammation, a frequent and unsuspected source of infection for the man, and capable of lighting up anew an ascending specific inflammation of the genital canal of the woman after labor or abortion.

Diagnosis.—A fecal abscess from the margin of the anus and extending to the posterior part of the labium majus may be distinguished by the greater disturbance on the part of the rectum and the wider diffusion of the inflammation. Phlegmon of the labium majus, which is often of angiolucitic origin, is situated usually on the external and cutaneous surface of the part, while abscess of the vulvo-vaginal gland occupies the internal and mucous surface. Furuncles are found in the skin and present a special appearance and evolution. Ulceration of a part of the wall of a purulent focus must not be confounded with soft chancre; merely mentioning it is enough to prevent the error.

Treatment.—Free incision of the cyst should be practised as soon as the inflammation appears; the bistoury is plunged in at the junction of skin and mucous surfaces within the free edge of the labium majus; care should be taken, by making the opening large enough,

that no cul-de-sac or pockets are left; drainage tubes are insufficient. It is good practice to extirpate the gland when the first incision is made, excising all the internal surface of the cavity with the curved scissors, washing the wound with strong carbolic solution, and tamponing with iodoform gauze. If there are old fistulæ from the spontaneous evacuation of the cyst, the gland should be extirpated in the same way, which is the only method of curing the interminable suppuration of these fistulæ, which close and open again continuously. The wound can be closed immediately with catgut sutures buried on superposed planes.

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CHAPTER XXII.

PRURITUS VULVÆ—COCCYGODYNIA.[1]

PRURITUS VULVÆ.—*Definition.*—The sensations of itching and heat which accompany eruption of the vulva or the irritating leucorrhœa of vaginitis, metritis, and cancer, and also, especially in children, symptoms of oxyuris, constitute only a symptom and not a disease; the characteristic of idiopathic pruritus is the absence of every lesion which could explain the intolerable itching which drives these patients to scratch and excoriate themselves.

Etiology.—In the absence of all apparent causes, certain authors have supposed the existence of a central origin.[2]

The arthritic diathesis, which G. de Mussey[3] considered a cause and whose influence is incontestable, produces no alteration of the derma which can be determined clinically.

As there are many cases where there is no lesion of any of the genital organs, so there are also many where the uterus or the ovaries are involved, and seem to act by a sort of reflex on the vulva; it is thus that vesical calculus causes acute itching of the glans penis.

Diabetes[4] is one of the most frequent causes of this affection, but it is difficult to decide whether it acts by the local irritation of the abnormal urine or by the central nervous system. Pregnancy also favors the appearance of pruritus, especially at the end and at the beginning of the period, when the congestion of the genital apparatus is most annoying.

Symptoms.—The itching sensation may be continuous or intermittent, returning at certain hours, especially during the night, when the heat of the bed aggravates it. Cases are also cited where it appeared every two or three days. Many women suffer from it at the menstrual periods, others only when they are pregnant. The seat of the sensation is most often over a large surface comprising the clitoris, the mons veneris, and the labia majora, or the clitoris may alone be involved.[5] The patient scratches, and the excoriations thus produced become the source of new itching. Finally, the friction of the parts leads to onanism (masturbation), and the profound excitement of the

nervous system results in serious disturbance of the general health and the mental powers, leading to anæmia and lunacy.

Diagnosis.—Any local source of the irritation must be carefully sought, and the uterus and its adnexa examined with thoroughness, as well as the urinary system and the rectum, and the presence of diabetes should be determined.

The prognosis is variable according to the cause of the affection, the most rebellious cases being those where the cause is most obscure.

Treatment.—In the first place the patient must be freed from every concomitant malady. The general nutrition should be modified by appropriate regimen when we have reason to think that she is arthritic or herpetic; causing her to abstain from alcoholic drinks, spices, fish and crustacea, etc.; giving slightly alkaline beverages, frequent laxatives, prolonged baths, and arsenic internally. If there is diabetes, the proper treatment should be employed.

Locally, the eruption should be treated. Topical applications of various kinds have been recommended for idiopathic pruritus; the best for the pain and discomfort is cocaine solution (1 in 10). Light cauterization has also been advised with nitrate of silver or strong carbolic solution; chloroform water, white wash, Van Swieten's fluid, menthol,[6] etc., have all been tried. Internally, the antispasmodics have been administered, but especially bromide of potassium and Cannabis indica. Schröder and Löhlein[7] have obtained success, the former in four cases, the latter in one case, by the excision of small portions of skin where the pruritus was localized; on histological examination, Schröder was unable to find any change.

Coccygodynia.—*Definition.*—Under this name has been described an intense pain, situated at the coccyx, which appears only in women and is often related to disease of the genitals. It was first described by Nott as neuralgia of the coccyx;[8] Simpson[9] then published the first complete memoir on the point, and gave the affection its present name; Scanzoni[10] also devoted some attention to the subject.

Etiology.—In the majority of the typical cases there is no appreciable lesion, and the disease seems to be simply a neuralgia. But in other cases there is some affection of the uterus, such as metritis, deviation, prolapse of the ovaries, etc., which do not explain the location of the intensity of the pain, but seem to be bound up with it in some way. In a third class of cases there is some lesion of the coccyx itself or of its ligaments, which may be the cause of extreme pain occasionally. Of this kind are the cases where there is abnormal

mobility of the bone, due perhaps to torsion or luxation during parturition, with anchylosis, abnormal length, or osteitis of the part (Nott).

The influence of labor seems beyond doubt. Scanzoni in 34 cases of his own which he collected found no case where the woman had not borne children; in 9 cases the pain appeared during the labor, and 5 were delivered with forceps; it is natural to suppose that the bone was luxated in these cases. It is interesting to notice that Hyrtl[11] found 34 cases where there was some vestige of luxation and subsequent anchylosis in 180 pelves which he examined for the purpose; we must then admit that the lesion is both very frequent and not very painful. It evidently does not constitute the only explanation of pain, for cases of coccygodynia are far more frequent than cases of luxation. Gräfe[12] observed 6 cases in women who had had unusually easy labors, and attributes no importance to luxation; in 2 of these cases the pain appeared at the end of pregnancy, and he thought that it was due to the pressure of the fœtal head upon the terminal portion of the sacral plexus, causing a neuritis.

Though the importance of coccygeal lesions may be slight, it must, however, be admitted. In a young girl observed by Zweifel the pain followed a fall which had probably fractured the bone; it disappeared at the end of a year. Scanzoni had two cases where riding horseback was of some influence. Zweifel and Courty have observed the affection in virgins, and Beigel in children; these latter cases are altogether exceptional.

Symptoms.—The capital symptom is pain limited to the coccyx and the parts immediately adjacent. It is intense, is worse on pressure, on sitting, in coitus, defecation, and all other efforts. Everything which jolts the part increases the pain, which is at times so intense that Scanzoni compares it with dental neuralgia. To assure one's self of the anatomical condition of the coccyx, rectal touch may be practised, and the bone seized between the index and thumb after local anæsthesia with cocaine.

Treatment.—The cure of concomitant disease, especially of retroflexion, will often cure the pain also. To diminish the suffering, hypodermic injection of cocaine may be employed (1 cgm.). Morphine injections and belladonna suppositories are also of benefit.

When there is no lesion of the bone, Gräfe recommends faradization, and has had good success with this means. He places one elec-

trode on the coccyx and the other on the sacrum, and increases the strength of the current at each session, which vary in number from three to eight. The surgical treatment is the only one in many cases which promises any assistance. With the design of preventing movements of the bone, Simpson made a series of subcutaneous sections of the muscles and tendons which isolated the bone completely; but this treatment is often unsuccessful. The best plan is to have recourse to complete extirpation of the bone, first performed by Nott. Many cases have thus been successfully treated which had resisted all other therapeutic agents.[18]

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CHAPTER XXIII.

WOUNDS OF THE VULVA AND VAGINA. ATRESIA AND STENOSIS. FOREIGN BODIES.

WOUNDS OF THE VAGINA AND VULVA.— *Etiology.*—Most frequently lacerations of the vulva and vagina result from coitus or parturition; they have also been observed after traumatism.

Coitus brutally performed at the first voluntary approach, or with violence, may lacerate the hymen, or even tear it off entirely; at other times the tear extends beyond the insertion of the membrane toward the nympha or vestibule; the vaginal wall is less often involved, but cases have been published where the posterior wall of this canal was ruptured by violence. Sabin[1] has reported a case where the recto-vaginal septum was lacerated from the vulva to the cul-de-sac of Douglas; and Barnes[2] mentions a specimen in the museum of St. George's Hospital where the vaginal laceration penetrated the peritoneum; it had been produced by coitus with an aged woman whose vagina was probably the seat of atrophic contraction. Breisky[3] cites a case, followed by cure, which may also be attributed to senile involution.

During parturition the hymen is often ruptured, for Budin observed it thirteen times in seventy-five primiparæ where it had been intact up to the end of pregnancy;[4] and this rupture may extend to the perineum (see the chapter on Laceration of the Perineum). The vagina has been torn during labor by the forceps and the cephalotribe.

Surgical traumatism which may cause the rupture of the vagina may be: violent manœuvres to reduce an old inversion of the uterus, extraction of a large fibroma, etc. The most frequent accidents observed are injuries by the horns of animals, falls upon a pointed object, the rough introduction or the long sojourn of foreign bodies.

Symptoms.—The seat of the laceration varies with the cause which has produced it.

The hemorrhage, which is at times very serious in laceration of the hymen, may be attributed to the occasional presence of erectile tissue

in the membrane, which Henle has described. The laceration may extend to the vestibule and the bleeding be so profuse as to threaten the life of the patient.[5]

When Douglas' pouch has been opened, a loop of intestine may escape; if not reduced, it becomes strangulated and gangrenous and leaves an ileo-vaginal fistula when death is not the result of the accident.[6]

If the rectum or the bladder be opened, there may be a persistent fecal or urinary fistula left.

The diagnosis raises important questions of a medico-legal bearing. There is a tendency to attribute all lacerations of the vulva in young girls to attempts at violent intercourse. Hofman[7] and Maschka[8] have shown that simple manipulations may have the same effect, and have therefore advised against a hasty decision, as there is frequently an attempt at blackmail connected with the charge of attempted rape.

Prognosis.—The hemorrhage is dangerous only when the woman is deprived of all assistance.

The inflammatory and septic complications which may follow the wound depend upon the care with which the injury is treated. It is worthy of note, and difficult of explanation, that lacerations which opened the peritoneum have been cured in the pre-antiseptic era, and also more recently in spite of the absence of all proper precaution against infection.[9] On the contrary, an insignificant wound, like the bite of a leech, if neglected, may cause grave suppuration.[10] Laceration of the vagina is especially serious during labor when there is any source of infection in the canal, such as vegetations, gonorrhœa, etc.

Treatment.—When the vulva and vagina are abnormally narrow, a prophylactic treatment should be begun during pregnancy. For the laceration itself, the general rules for all traumatic lesions should be followed: arrest of the bleeding by ligature, permanent forci-pressure, or hæmostatic suture; closure of the wound after reduction of any viscera which have extruded by the solution of continuity; antisepsis of the region. Loose tamponing of the vagina with iodoform gauze should follow its suture, and gentle compression of the parts be maintained by a T-bandage.

Acquired Stenosis and Atresia.—*Etiology.*—In the great majority of cases the contraction (stenosis) and obliteration (atresia) of the vagina or vulva are the result of difficult labors. If the eschars produced involve the whole extent of the wall, they may leave fistulæ

when they fall, either fecal or urinary; if only a portion of the thickness of the wall has been destroyed, the cicatrix which succeeds may undergo retraction, and often the parts in contact unite by immediate secondary union.

It is possible that the cicatrix may be due to injury by a foreign body which has violently penetrated the vagina and transfixed it, or by its long sojourn has caused ulceration, as in the case of forgotten pessaries.[11] Cauterization for surgical [12] purposes or to produce abortion,[13] eschars due to gangrene in an infectious disease, lupus of the vulva and syphilitic ulceration, suppuration in the lower pelvis (phlegmonous dissecting peri-vaginitis), may all be the causes of contraction by cicatrices. Vaginitis alone, both in children (Simpson [14]) and adults (Hildebrandt [15]), may produce a fusion of the walls of the canal.

There is a rare cause which acts almost wholly on the upper portion of the vagina in the neighborhood of the cervix, namely, senile atrophy. The canal contracts, becomes infundibuliform, and at the bottom of the cone thus formed the atrophied cervix may be perceived with difficulty. It is at times hard to distinguish these cases from those where the contraction is the result of cicatrices or cancer.[16] This contraction is seen only in women who have not been accustomed to coitus; I have seen one curious case.

Symptoms.—The cicatrices may occupy the entrance of the vagina when they are the result of traumatism, or of gangrene in young children, but the great majority of these adhesions and contractions are the effect of wounds received during parturition, and hence their situation is deeper, actually in the vagina. The disturbance which results is developed very slowly and at times for a long while retarded by the constant dilatation of coitus; a slight degree of permeability suffices for the escape of the menstrual fluid and the performance of coitus. It may thus happen that the patient has had a very pronounced lesion without having her attention attracted to it. If, however, the orifice is very narrow, there may be dysmenorrhœa of the variety which is termed obstructive.

If the obliteration is complete (atresia), the menstrual blood accumulates above the obstacle and distends the vagina in whole or in part, as well as the uterus and the tubes (hæmatocolpos, hæmatometra, hæmato-salpinx). (See Retention Accidents following Atresia of the Genital Passages.) On the contrary, accidental obstruction of the genital canal has occasionally produced amenorrhœa—a fortunate circumstance which prevents serious results.[17]

The stenosis may present as an annular cicatrix forming a sort of diaphragm, whose projection acts as an obstacle to the escape of the uterine secretions which accumulate above it. The ring is often incomplete, in the form of a falciform band stretching across the external os, which it may altogether conceal, so that it is inaccessible to the touch except through the cicatricial membrane.

Certain deviations of the uterus seem to be due to this cause, as I have frequently observed. At the same time there is almost always metritis, produced no doubt by the presence of an obstacle to the ordinary drainage of the uterine cavity. The contraction may be so narrow that the orifice which gives passage to the menstrual flow is discovered only with difficulty.

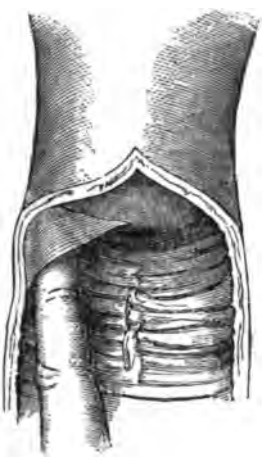

FIG. 135.—FALCIFORM CICATRICIAL BAND FROM THE VAGINAL WALL TO THE CERVIX (BARNES).

The treatment of the acquired atresiæ resembles that of the congenital; an artificial vagina may have to be created either to permit coitus, or for the remedy of grave retention effects.

Cicatricial bridles which produce simple contractions or stenoses may require the interference of the surgeon in three different sets of circumstances; when the uterus is not gravid, during pregnancy, and at the moment of parturition.

1. *In the non-Gravid Condition.*—It is not only to destroy an obstacle to the performance of the conjugal relations that the affection requires treatment, for these bridles form the starting-point of abnormal reflexes, like foreign bodies, producing pain and metrorrhagia.

The simplest method of dividing them consists in removing them with the finger without the aid of the speculum, but depressing the cervix and adjacent parts if necessary with forceps; then they may be cut in successive strokes with the long scissors, taking great care not to wound the vaginal wall.[18] This section may be accomplished in several sessions, each followed by dilatation; at first by tamponing with iodoform gauze, then with cylinders of rubber or Bozemann's dilators, which are used in the preliminary treatment of vesico-vaginal fistula. Later it is well to introduce a Dumontpallier or Hodge pessary to keep the vaginal walls separated. If the cicatrix is very thick and of great extent, it is better to excise it, and cover the loss of sub-

stance by a healthy flap of mucous membrane dissected from the immediate vicinity.[19]

With vaginal cicatrices which contract the canal, there may also exist a rectal or vesical fistula; where this is the case, the destruction of the former may enlarge the fistula, and this fact may lead the surgeon to decide in favor of indirect treatment by obliterating the vagina by colpocleisis.

2. *During Pregnancy.*—Contractions and stenoses of the vagina in the gravid female raise serious questions as to operation—whether to provoke abortion or premature labor, or simply to destroy the obstacle, and allow the pregnancy to proceed. Oldham in a case of this sort[20] caused premature labor and saved his patient; Doherty[21] could not bring himself to adopt this plan, and his patient died. Churchill[22] declares in favor of such interference with the object of preventing rupture of uterus and vagina, which is frequently the result of temporizing. But progressive section of the bridles may allow sufficient dilatation, and at the time of labor the parts are so much softened that a cicatrix is rendered very elastic, which before seemed inextensible.

3. *At the Time of Parturition.*—It may happen that the condition of the vagina has been ignored until the labor has begun, and we find ourselves in the presence of the obstacle. Where spontaneous dilatation is manifestly impossible, Churchill and Doherty recommend vaginal incisions, taking the risk of seeing them extend to become lacerations and cause fistulæ; after that, craniotomy must be employed. These measures of necessity in a very narrow and easily torn vagina are not free from danger, and I consider Porro's operation preferable,[23] for it eliminates new risk to the woman and thus is better than the Cæsarean section. Porro's operation is absolutely indicated if the contraction is so complete that the escape of the lochia is impossible, and especially, as in a case of Levy's, if contraction over a large extent has occurred during pregnancy.[24]

FOREIGN BODIES.—The list of foreign bodies introduced into the genital passages, and left there, includes pessaries, sponges, tampons, spools, pomade jars, boxes, bottles, pencils, hairpins, etc.; intestinal worms and insects have also been found there.

Etiology.—Children will at times pass various objects into the genital canal in play, but most often it is some instrument which serves for masturbation which escapes the fingers, and glides into the deeper parts of the canal; occasionally broken canulæ or frag-

ments of glass specula may be left there by accident. Very rarely a foreign body in the rectum or bladder will ulcerate through into the vagina.

Symptoms and Course.—If the object is hard and not porous, it may be aseptic for a long time and so be tolerated, as is the case with pessaries of hard rubber or metal. But the steady pressure upon one point ends in ulceration of the tissues, and I have seen a case where the pessary had been forgotten, had burrowed under the mucous membrane for a certain extent, and then the membrane had healed over it like a bridge, so that it was necessary to cut the loop thus formed in order to extract the instrument.

In other cases the foreign body becomes tolerable by a peculiar process which resembles that found in certain neoplasms, namely, by calcification; pointed objects, like pins, are thus prevented from wounding the parts. Getschel[25] has observed one of these calculi which recalled those formed in the bladder in similar circumstances. Some of the cases, cited by the older authors, of vaginal stones may be only fibromata of the uterus which had become calcified, or vesical calculi which had ulcerated through the anterior vaginal wall.

If the object is porous, it may become infected and cause inflammation and progressive ulceration; thus, a hairpin has been extracted from the vagina, where it had been for sixteen years, and had produced a vesico-vaginal fistula.[26] In 1887 I saw in Freund's service at Strasburg a woman who had suffered for ten years after the introduction of a hairpin into the uterus to provoke abortion; laparatomy was performed and pyo-salpinx discovered, and, stuck in the purulent pocket, the hairpin was found, rusty and eroded.

Pelvic suppuration has followed immediately or after the lapse of a certain time, with peritonitis.[27]

The irritation produced about a foreign body of some size may cause a circular contraction of the vagina. Breisky[28] has seen almost complete obliteration of the canal below a spool which had become encysted in the superior portion of the vagina.

Usually the foreign body, even when tolerated, causes a profuse leucorrhœal discharge, which may become purulent, and be accompanied by hemorrhages. The bleeding comes not so much from the ulceration of the vaginal wall as from the uterus, whose mucous membrane has been infected from the vagina.

The diagnosis may be very difficult when the foreign body is buried in the tissues and hidden by contraction; the assertions and

memories of the patient are never trustworthy. Exploration with a sound, aided by vaginal touch and at times rectal palpation, will be found of great service.

The treatment consists first in removing the foreign body, and then in curing the lesions which it has caused.

Small free objects in the vaginal pouches, like insects, intestinal worms, etc., are extracted without difficulty by irrigation through a wide speculum which separates the walls freely. If there is a contraction of the vagina below a hard round body, it may be expelled by pressure through the rectum. It is usually advisable not to employ the speculum in extracting the object after its situation has been determined with the aid of this instrument, but sometimes a short blade is useful to depress the fourchette.

The forceps are passed along the finger which is held close to the object to be removed, and, if there are bridles, they should be cut with the scissors, using the finger as a guide more than the sight. Hairpins are an important class by themselves, and are almost always found with their points directed forward, so that they must first be disengaged and then removed. If the foreign body is large and covered with asperities, no effort of extraction should be made unless the vaginal wall is protected with retractors, and the object has been seized with a lithotomy forceps. If the object is very large and hard, it may be extracted with Segond's instrument for polypi; if stony, it may be crushed with the instruments used for large vesical calculi.

The vagina should be carefully disinfected with antiseptic solutions, especially where the object was lodged, and the metritis which is almost always present treated by the curette.

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CHAPTER XXIV.

MALFORMATIONS OF THE VULVA, AND HERMAPHRODISM.

THE genital organs of the two sexes have the same origin, being developed from the Wolffian body, Müller's ducts, and the genital glands.

The organ of Wolff or of Oken, or the primordial kidney, is a temporary organ which is already well developed by the thirty-fifth day, but disappears at the end of the second month. It extends from the summit of the thorax to the pelvis on either side of the vertebral column. It consists first of two longitudinal ducts, and then there develop a series of straight tubes which afterward become flexuous, and empty into the two primitive conduits; these are situated in front of the glandular mass and outside of it, and seem to be the excretory ducts. They end posteriorly in the lower part of the genito-urinary sinus, a large depression which later becomes the vulva, the perineum, and the margin of the anus. On the inner portion of the Wolffian body, there appear in the fifth and sixth months the genital glands which develop into either ovaries or testicles; as they increase, the Wolffian body lessens, atrophies, and is finally shut off by a fold of peritoneum.

The permanent kidneys develop behind the Wolffian body, and remain independent of the rest of the genital apparatus; their excretory ducts, formed from a diverticulum of the Wolffian duct, open into the bladder, and this viscus, as also the urethra, is formed at the expense of the allantois, which is a process derived from the rectum in the fœtus. That portion of the allantois which extends from the upper part of the bladder to the umbilicus forms the urachus and becomes the superior ligament of the bladder. Two other ducts are formed parallel with those of the Wolffian body, situated above and external to them, which are called Müller's ducts; they fuse below and open into the inferior part of the allantois below the vesical dilatation at the place where the urethral canal is formed. The cavity

where the Müllerian ducts empty communicates freely behind with the rectum, and this junction is termed the cloaca (see Fig. 138, 1 and 2).

Up to the third month the embryo has no sex, or rather has the

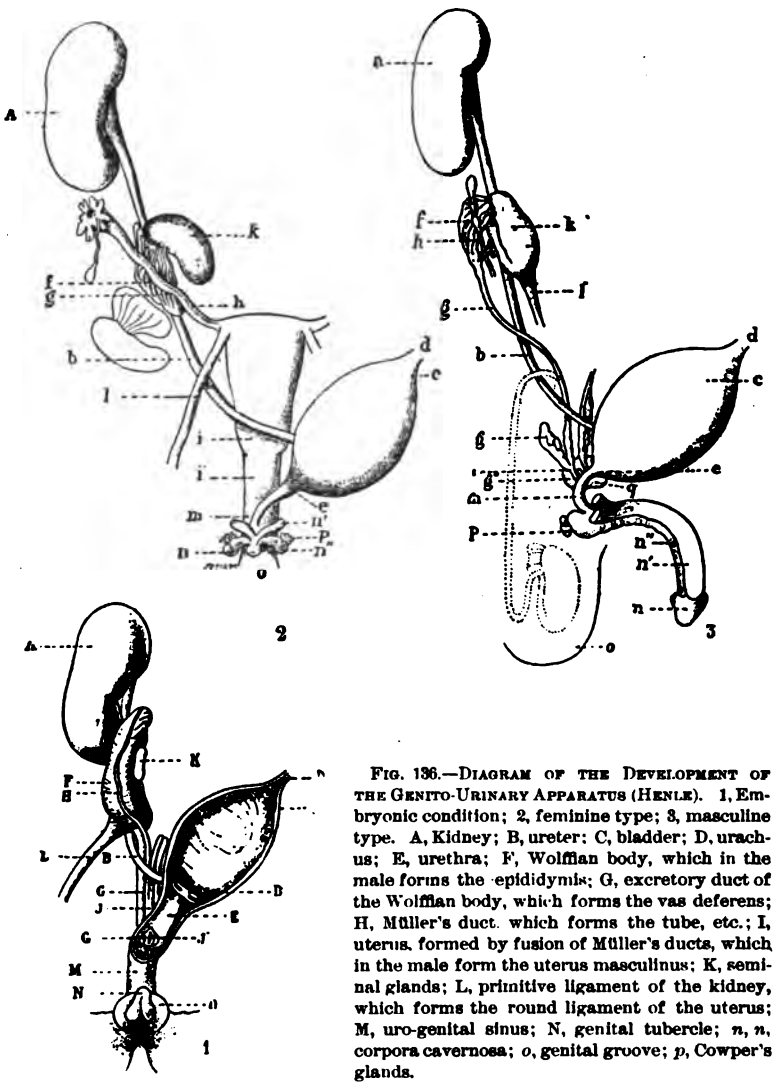


FIG. 136.—DIAGRAM OF THE DEVELOPMENT OF THE GENITO-URINARY APPARATUS (HENLE). 1, Embryonic condition; 2, feminine type; 3, masculine type. A, Kidney; B, ureter; C, bladder; D, urachus; E, urethra; F, Wolffian body, which in the male forms the epididymis; G, excretory duct of the Wolffian body, which forms the vas deferens; H, Müller's duct, which forms the tube, etc.; I, uterus, formed by fusion of Müller's ducts, which in the male form the uterus masculinus; K, seminal glands; L, primitive ligament of the kidney, which forms the round ligament of the uterus; M, uro-genital sinus; N, genital tubercle; *n*, *n*, corpora cavernosa; *o*, genital groove; *p*, Cowper's glands.

elements of both sexes—its sex is indifferent and indeterminate; but at that time the internal organs begin to develop toward the masculine or the feminine type.

If the first shall be developed, the ducts of Müller disappear and

leave only a vestige of their lower extremity, fused and opening into the uro-genital sinus, to become the prostato-membranous portion of the urethra; they open at this point by a common orifice, terminated by a cul-de-sac, the prostatic utricle or uterus masculinus. At the same time the median portion of the Wolffian body forms the head of the epididymis and the tail of that organ, the vas deferens and ejaculatory ducts coming from the Wolffian ducts; the genital gland is transformed into the testicle (Fig. 136, 1 and 3).

If the individual is to be of the feminine sex, the genital gland becomes the ovary, Müller's duct persists, the Wolffian body and canal atrophy and almost entirely disappear, leaving only the organ of Rosenmüller as their vest' e in the broad ligament.

The upper portion of Müller's ducts forms the Fallopian tube,

FIG. 137.—DEVELOPMENT OF THE EXTERNAL GENITAL ORGANS (ECKER). 1. Lower portion of an embryo at the eighth week; hermaphrodite stage, enlarged two diameters. *e*, Glans at the summit of the genital tubercle; *f*, genital groove ending behind at the anus and thus forming part of the cloaca; *hl*, genital folds; *s*, extremity of the body of the embryo; *n*, umbilical cord. 2. Embryo at about the tenth week, female. *a*, Anus; *ug*, uro-genital sinus; *n*, edges of genital furrow or labia minora. 3. Embryo a little younger than the preceding, to show the stage which precedes the indication of the sex. 4. Male embryo at the end of the fourth month.

the middle and lower parts blend and constitute the vagina and uterus; this union begins at the inferior portion, and the short conduit so formed communicates with the cloaca. At the end of the second month the two Müllerian canals are in apposition but still separated throughout their whole extent, except at the orifice, by a septum which results from their junction, and which persists at the upper part until the fourth month.

The round ligament is formed from the ligament of the Wolffian body, and is inserted at the junction of the superior with the middle third of Müller's duct; this point is important for the appreciation of arrested development (Fig. 136, 2).

The external organs are developed at the expense of the genital tubercle, which appears, according to Kölliker, at the sixth week of fœtal life, and is well developed at the end of the two following weeks.

On each side two folds become prominent which are called the genital folds. At the end of the second month the genital tubercle becomes prominent, and on its posterior aspect we can then recognize the presence of a furrow directed toward the orifice of the cloaca which gives it a bifid appearance, and is termed the genital groove. The perineum also advances under the form of a median projection and two lateral folds[1] which meet in the middle line, forming the rhaphé, toward the point where the allantois empties into the rectum, transforming the recto-allantoid cloaca into two portions, the uro-genital sinus situated anteriorly, and the anus behind. The inferior segment of the allantois retracts to form the urethra, and the Müllerian ducts fuse to form the vagina (Fig. 138, 3, 4, 5).

This transformation of the cloaca is effected during the third month, and at the same time the difference in the sexes may be determined (Fig. 137); in the male embryo the genital tubercle becomes the penis and the genital furrow forms the penile portion of the urethra, while the genital folds, situated behind, blend to form the scrotum; in the female these folds become the labia majora, and the edges of the furrow are the labia minora, the genital tubercle appearing as the clitoris.

The genital groove does not close more in front than behind, and thus the female lacks the clitoridian portion of the urethra; and this canal in the adult opens at a point homologous with that where it was found in the fœtus of eight weeks—a disposition which is found in the male when the proper development of the parts has been arrested (hypospadias). The corpus spongiosum of the urethra, the product of the erectilized borders of the genital furrow, is also completely developed in the male, and entirely surrounds the canal in the pendulous portion. But in the female it aborts in the intermediate or vestibular portion, and is reduced to its two extremities below, to the bulb of the vestibule, homologue of the bulb of the male urethra, but divided by the persistent genital opening; and above it forms the glans of the clitoris which covers the corpora cavernosa clitoridis, homologues of the similar structures in the male penis.[2] At the internal part of the bulb of the vestibule there are vestiges of a membranous organ which reaches its full development in the male, namely, the bulb of the urethra; it is this which forms the hymen. Above, joining bulb and hymen to the clitoris, and representing the vertical or cylindrical portion of the masculine corpus spongiosum, there is in the female a band with a vascular bundle running in it, the frænum

masculinum vestibuli, which I have already described and which Kobelt terms the intermediate plexus.

To appreciate the homology between the external organs of the two sexes, it is only necessary to suppose the penis split from the meatus to the bulb; the section of the urethra in the male just where it enters the bulb exactly represents the urinary meatus of the female surrounded by the bifurcation of the frænum masculinum, which is a vestige of the corpus spongiosum of the male. To complete the symmetry, the penis may be considered as elevated and applied to the pubic symphysis, placing the glans in the same subpubic situation that the glans clitoridis occupies. It is then easy to recognize the following homologies, which I have sought to establish since 1884:[3]

Glans clitoridis.	Glans penis.
Prepuce of clitoris.	Upper part of prepuce.
Corpora cavernosa of clitoris.	Corpora cavernosa of penis.
Frænum masculinum and intermediate plexus of Kobelt.	Cylindrical portion of corpus spongiosum of urethra.
Hymen and bulb of vagina.	Veru montanum and bulb of urethra.
Frænum of clitoris.	Frænum of penis.
Labia minora.	Deeper layer of scrotum.
Labia majora.	Superficial layer of scrotum and sheath of penis.
Vestibule and small portion of vagina behind hymen (1 to 2 mm.).	Membranous and prostatic portions of urethra to prostatic utricle, which is analogous to the Müllerian vagina.
Bartholin's glands.	Cowper's glands.

The uro-genital sinus is at first relatively long, and is directly continuous with the allantois, that is, with the urethral canal. Later in the course of the development there remains only a vestige of it as a very short canal, which might be called the vulvar canal, which prolongs the vestibule immediately behind the hymen (Fig. 138, 4 and 5). This space, which almost wholly disappears in the adult female, is still very noticeable in the young girl, and to that fact is due the deeper situation of the hymen in children, as described by Budin. The unequal development of these various parts completely hides their primitive relations after birth; it is thus that the vulvar or ves-

tibular canal, the last vestige of the anterior portion of the uro-genital sinus, seems directly continuous with the Müllerian vagina, while in the embryo it exists as an independent structure and forms the lower portion of the prolongation of the allantois or the urethral canal (Fig. 138, 4). In other words, it is primitively the Müllerian vagina which seems to empty at the entrance of the urethra at the vestibular expansion, while later it is the urethra which appears to open in the vaginal orifice which has become blended with the vestibule (Fig. 138, 5.) This distinction which I have drawn between the Müllerian va-

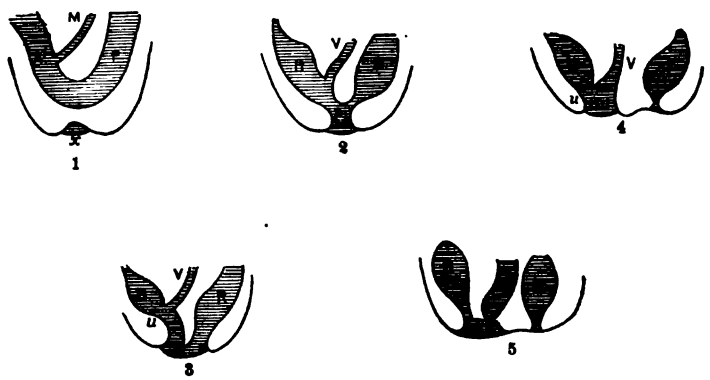


FIG. 138.—DEVELOPMENT OF THE EXTERNAL GENITAL ORGANS. Diagrammatic (Schröder.) 1. R, Rectum, continuous with *All*, allantois (bladder), and M, Müller's canal (vagina); *x*, depression of the integument below the median tubercle, which by its progress inward forms the vulva. 2. The depression has extended inward to become continuous with the rectum and the allantois to form the cloaca *Cl*. 3. The cloaca has split into the uro-genital sinus, S*u*, and the anus, *u*, by the downgrowth of the perineal septum. The Müllerian canals are fused to form the vagina V, behind the bladder B and the orifice of the urethra *u*. 4. The perineum completely formed. 5. The upper portion of the uro-genital sinus contracts to form the urethra, the lower portion persists and forms the vestibule *u*, into which both urethra and vagina empty.

gina and its vestibular antechamber is of the greatest importance in considering malformations of the parts.

If the development of the parts be arrested at this time, the following forms may be produced:

1. Complete atresia of the urethra and vagina, resulting from absence of the division of the genital tubercle and of the genital furrow which prolongs the opening of the uro-genital sinus forward; in this case there is no vulvar opening. According as the cloacal septum has been perfect or incomplete, the rectum, the bladder, and the genital canal are separated or in communication (Fig. 139, 1, 2). Infants with this malformation are seldom viable. The urethra being absent or imperforate, the bladder and the genital canal are enormously distended with urine.

The absence of the cloacal septum is at times observed alone, the

uro-genital sinus being open and communicating freely with the rectum, which does not reach the anus but appears to end in the vagina; this form is called ano-vulvar, vestibular, and ano-vaginal atresia (atresia ani vestibularis, seu ani vaginalis,[4] Fig. 138, 3). In reality it is not into the vagina that the rectum opens, but into the uro-genital sinus, which receives also the vagina, at times imperfectly separated from the rectum by a septum, and the urethra. This renders the homology difficult to establish, and the relations of the parts have been subordinated to their dimensions, which are altogether

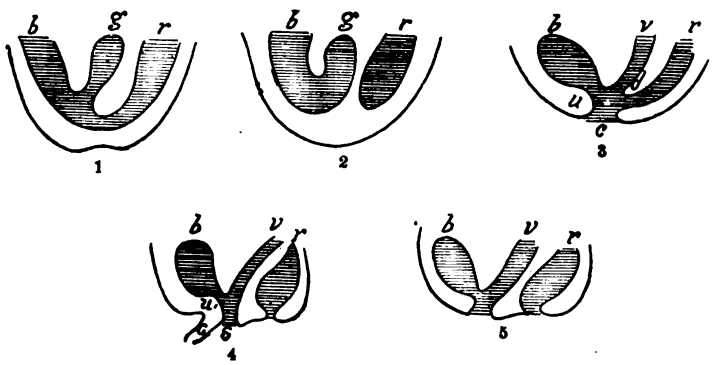


FIG. 139.—MALFORMATIONS OF THE EXTERNAL GENITAL ORGANS. Diagrammatic. (Schröder.) 1. Complete atresia of the vulva. *r*, Rectum; *g*, genital canal; *b*, bladder, communicating with both. 2. Complete atresia of the vulva; *r*, rectum separated from the allantois; *b*, bladder, and *g*, genital canal, distended with urine. 3. Atresia of vagina and anus. *d*, Perineum, incomplete; *b*, bladder; *v*, vagina, and *r*, rectum, open by a common cloaca. 4. Hypospadias in the female. First degree coincident with hypertrophy of the clitoris. *s*, Persistent uro-genital sinus, to which succeeds the long vestibular canal; *u*, urethra, and *v*, vagina, opening into the vestibular canal; *c*, hypertrophied clitoris. 5. Hypospadias in the female, properly so called; the allantois wholly transformed into a bladder which opens directly, without the intermediate urethra, into the uro-genital sinus; that is, into the vestibule.

accessory. The malformation may be simply a congenital ano-vaginal fistula.[5]

Hypospadias in the female corresponds to an analogous arrest, though not so pronounced. The perineum has developed normally, but the uro-genital sinus has preserved its embryonic condition. In certain cases of the first degree of this malformation, the vulvar or vestibular canal is long and narrow, like the urethra, and receives high up the urethra and vagina. This condition has wrongly been considered only a simple opening, at a high level, of the urethral canal into the vagina, retracted below; hypertrophy usually involves the clitoris in this malformation (Fig. 139, 4).

Hypospadias proper occurs when the uro-genital sinus has regu-

larly disappeared, but the lower portion of the allantois which should form the urethra has been taken to form the inferior part of the bladder. The urethra is lacking altogether, and bladder and vagina open into the vestibular canal,[6] which gives the clinical appearance of the vesical orifice being in the vagina.

Epispadias.[7]—This is a rare condition in the female, and its mode of origin is still a matter of doubt; it may coincide with ectropion of the bladder and defect in the pubic symphysis, as well as with atresia of the anus. It is certainly related to defective disposition of the allantois which forms an obstacle to the development of the urethra and the occlusion of the anterior portion of the vulva;[8] the clitoris is occasionally bifid.[9]

I will not speak of ectropion of the bladder, which does not belong to my subject, but only of those cases where the lesion is confined to the urethral canal, which is one of the external genital organs in the female. Instead of the vestibule and meatus, we find at times a wide furrow, opening above, or a horseshoe orifice with its convexity applied to the symphysis; the vesical mucous membrane may project like a collar from this opening, and the clitoris may be absent, as in a case of Nunez, or bifid. The labia majora diverge above, and the nymphæ are attached to the fissured clitoris; often the symphysis presents a separation. The incontinence of urine is never complete, and the patients may have the power of retaining it for a long time; but the least effort causes it to issue, and it must be passed as soon as the necessity is manifest.

The ureter very rarely opens into the vagina or the vulva, but it is of interest on account of the congenital incontinence of urine which it causes.[10] Independently of the cases where the two ureters emptied into the vagina in the absence of the neck of the bladder and of the urethra, one of these canals has been seen to open near the meatus. This anomaly has been explained as follows: The ureter is formed by the budding of the Wolffian canal in the form of a tube toward its cloacal portion; at a certain level this tube receives lateral buds which are to form the urinary canaliculi, which terminate its superior extremity, and its lower end is partly of the cloacal extremity of the Wolffian body and presents thus a portion which is common with that canal, of very short extent and temporary duration. The duct of Müller, which descends along the canal of Wolff, empties into the cloaca near the canal of which it remains the neighbor but inferior to the ureter. The anomaly arises when the ureter is tardy in its de-

velopment if the original bud on the Wolffian canal appears not near its lower end, but high up in the uro-genital sinus, and thus the ureter loses its normal relations; it does not empty high enough, but follows the course of the Wolffian duct, which descends to the vestibule,[11] and confounds its origin with the vestiges of that embryonic organ.[12]

Total absence of the vulva is characterized by the simple opening of the uro-genital sinus at the vulvar region, although none of the parts constituting that region have been formed. This malformation may coincide with the normal development of the other genital organs according to many cases cited by the older authors, but the fact is not beyond question. Foville[13] reports one case which seems to be explicable by the fusion of the labia majora rather than by their non-development. There is generally an absence of all projection of the vulvar region in those infants, usually still-born, which present total atresia of the vulva and urethra, but the first part of this malformation is wholly accessory.

Absence of the greater labia is the rule in cases of ectropion of the bladder, and it may also be observed independently of all other anomalies, as I have myself seen. The nymphæ may also be absent,[14] and this condition is often related to incomplete development of the clitoris. It is more frequent to see them hypertrophied. At times they form two or more juxtaposed leaflets, or they may exceed the labia majora in size, and project beyond them. This condition, which is common in certain tribes, has been termed the "Hottentot apron."[15] Absence of the clitoris coincides at times with epispadias.

The infantile condition of the vulva is observed in certain weak patients, and also in imperfect development of the uterus and tubes. According to Freund, this state of the tubes predisposes to inflammation. The indications furnished by examination of the vulva have then a certain clinical value.

Hypertrophy of the clitoris is unusual in our climate, but quite frequent in the tropics. It may render the sex uncertain when it coexists with apparent occlusion of the external genitals. Hypertrophy of the clitoris has also been observed as an accessory malformation in certain cases of hypospadias and division of the genital canal (Fig. 144). Union of the nymphæ appears to be always a congenital anomaly, but it may result from a process like that which joins prepuce and glans in phimosis in little boys; thus in very young girls the nymphæ may be found united up to the urethra in such a way as to

impede micturition. These adhesions may be easily separated by simple traction.[16] The labia majora may also be united over a certain extent anterior to the fourchette.

Development and Malformation of the Hymen.—The hymen develops slowly in the female embryo; it is only at the nineteenth week that we notice a fold about the vulvar opening at the anterior extremity of the vaginal canal, which is formed above by the fusion of the Müllerian ducts and below by the remains of the vestibular canal of the uro-genital sinus. At first there are two linear projections which advance to the median line, where they meet; the hymen is at this time a double fold, and the band which forms each

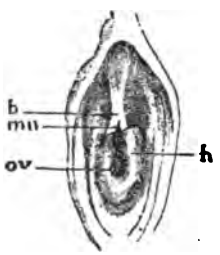


FIG. 140.—INFUNDIBULIFORM HYMEN AND FRÆNUM MASCULINUM IN THE NEW-BORN. *h*, Hymen; *ov*, vulvar orifice; *b*, frænum; *mu*, meatus.

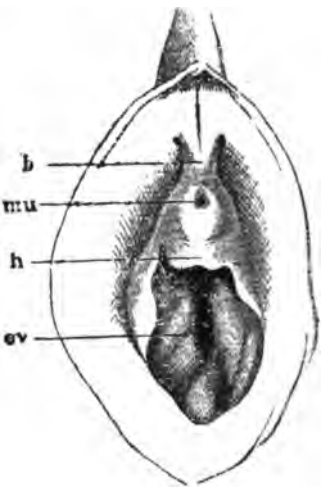


FIG. 141.—REMAINS OF THE HYMEN AND FRÆNUM IN A WOMAN WHO HAD BORNE CHILDREN. *b*, Frænum; *mu*, meatus; *h*, hymen; *ov*, vulvar orifice.

side of the opening extends from meatus to the base of the clitoris. When the vulvar orifice and the hymen are formed, this band surrounds both openings, forming at the first the collar of the hymen, and at the second a ring, which is very plain in children, continuous with the hymen below, and above with the median projection analogous to the frænum in masculine hypospadias. The hymeneal apparatus thus comprises the hymen, the ring about the meatus, which is sufficiently marked to merit the name of urethral hymen, and the frænum masculinum of the vestibule. Anomalies of development may involve all three of these divisions; and their intimate connection, until now unrecognized, permits us to explain all the difficulties which occur.[17]

This theory of the origin of the hymen is contrary to that which is generally accepted.[18] Since the teachings of Blandin in France and of Henle in Germany it has been supposed that the hymen was only a projection from the vagina.[19]

Infantile Hymen.—In the infant at birth the entire hymeneal apparatus is well developed and its three portions are very distinct. The hymen presents a considerable size, so that it may be mistaken by the inexperienced for the nymphæ, and the erroneous conclusion may be drawn that the hymen is absent or destroyed; this error might be of importance in medico-legal inquiries.[20]

The usual form of the hymen is the labiated (Brouardel), although it may be found as a projecting collar, more prominent at its lower part, or like a purse folded in the form of a tobacco pouch. In the labiate form an antero-posterior opening separates the two valves which go from the bulb of the vagina to the posterior part; in the new-born a bougie of 9 mm. may be passed in; this form persists throughout life. In the infant of seven years a bougie of 10 mm. may be passed, and in the marriageable woman the end of the finger may be introduced with little effort.

The left lip of the hymen may project posteriorly, and the other anteriorly; there is then an intercrossing like the crura of the diaphragm, and this disposition on different planes forms an orifice which enters the vagina obliquely from right to left.

Brouardel's remarks on the medico-legal importance of the hymen in little children are very weighty. If the thighs are widely separated, the hymen is stretched, and will not permit the passage of the finger; but if the limbs are brought together, it folds in a gusset and its posterior valve is depressed, leaving a large orifice which permits a great deal of stretching. Penetration of this opening offers no difficulty, and it is well to note that there was no more obstacle to the penis of the accused person than to the finger of the expert.

It often happens that the crescentic portion of the membrane which is inserted near the anterior column of the vagina suffers an arrest of development, and the free border then presents notches; two of these are fairly constant, being situated nearly symmetrically at the junction of the superior with the middle third of the structure, and 2 or 3 mm. in extent. In certain cases there is but a single notch, and the other branch is intact. More rarely there are four of these impressions, two situated behind at the junction of the inferior third with the upper two-thirds, and the others as above anteriorly;

so that the membrane of the hymen is formed by two projections posteriorly, two more on the sides, and two smaller ones anteriorly. The seat of these notches and the integrity of their free borders when unfolded permits us to distinguish an arrest of development from lacerations.

Injury to the hymen as the result of coitus is not constant. Penetration may be accomplished without laceration of the membrane, especially if the woman consents. Budin has seen the hymen in its normal condition thirteen times in seventy-five primiparæ.

Brouardel and Laugier have shown that laceration of the hymen may heal completely in a few days after it has been torn by intercourse, but attentive examination will suffice to discover the white fibrous cicatrices.

On the other hand, the normal furrows of the part are often mistaken by the inexperienced for old lacerations; this error may be avoided by introducing the finger and tracing the cicatrix.

In little girls there are other morphological peculiarities of congenital origin, with which the physician should be familiar in order to prevent serious mistakes. The small white points which resemble grains of hemp, caused by hypertrophy of the sebaceous glands, are not, as has been asserted, the proof of masturbation. Dolbeau has described a special deformity of the vulva which depends on attempts at coitus with too narrow genital passages. He applies the term vulvar canal to the infundibulum or false passage, made by the penis above the fourchette; a very similar vestibular canal is found in the abnormally developed fœtus, and at times is a family characteristic. Brouardel reports a case where he had found a vulvar canal in a little girl into which he could pass the thumb. The mother accused the father of attempting intercourse with his daughter while she was absent with another child. Brouardel examined both children and found the same condition, which was evidently a family peculiarity.

Anomalies of Situation.—In the child at birth the hymen is placed far more deeply than in later years, the vestibule being sunken (Budin), and this condition is very pronounced in the negro race.[21] In the adult the hymen may be placed very high, Krimer having found it in one case, where the woman was twenty years old, at a depth of 2 cm., the vulvar orifice seeming on first sight to lack the membrane altogether.[22]

Anomalies in Number.—Cases are reported in the literature of

the subject of double hymen. Some of these are due to occlusion of the vagina by membranes, especially in the new-born, following adhesions between the walls of the canal, with a collection of mucus above;[23] other cases in the adult[24] are probably only an analogous lesion which has persisted from fœtal life or from infancy. The reversal to the condition which is normal in some animals may perhaps be found, as I will describe farther on; thus, Frisco, of Metz,[25] found five membranes in a pregnant woman who had had the hymen divided at puberty for the retention of menstrual fluid.

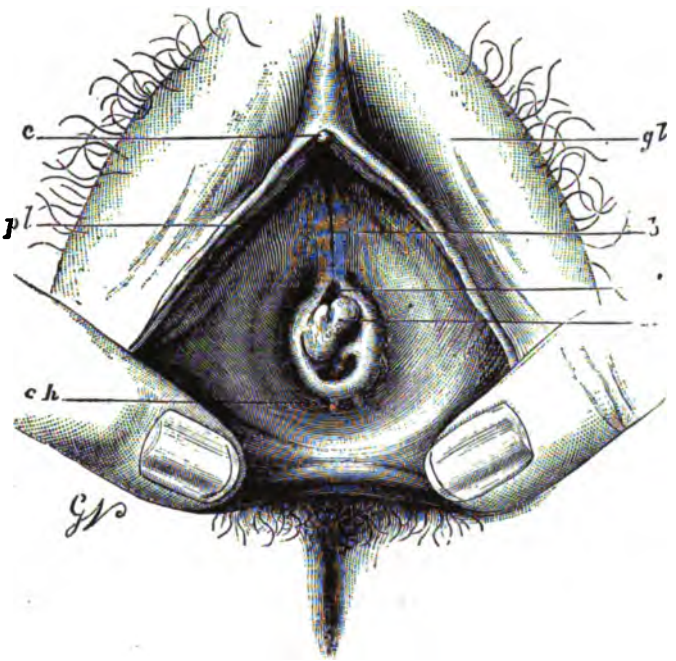


FIG. 142.—FLESHY SCULPTURED HYMEN IN A YOUNG VIRGIN.

Anomalies of Form.—If the theory which I have formulated be accepted, we shall not be surprised at the great variety in the form of the hymen which we encounter. We have not to do with a fixed organ, but with the vestige or embryonic residuum of the corpus spongiosum,[26] which is completely developed in the male but aborted in the female, in whom it persists as a membrane except at the most external portion, which becomes erectile to form the bulb of the vestibule. This extreme variability is as easily explained as that of the organ of Rosenmüller in the female or the organ of Giraldés in the male.

However that may be, there is one form which is very common in

the adult, namely, the annular; the hymen is termed circular when it has an exactly central orifice; semilunar when it is chiefly attached at the superior border, which gives it the shape of a crescent; falciform [27] when the opening is very large, and leaves only a small fold at the bottom.

These varieties have been described under many names; the denticulate hymen (Fig. 142) is usually thick and fleshy, and is a persistence of the infantile type; in a medico-legal examination it must be unfolded to determine whether it has been lacerated, as the irregular folds would lead one to think.

The linguliform hymen is a variety of the preceding.

The fringed variety is very rare.[28] The infundibuliform hymen, turned forward like the calyx of a flower, is a reproduction of the infantile type; if very pronounced, it is termed hypertrophic, and is often associated with very grave malformation of the genital organs. The hymen septus or biseptus presents two openings separated by a band, which is usually enlarged at its posterior part. This disposition, which is not common, is considered a decisive proof of the Müllerian origin of the membrane,[29] but it has no real value, as is evident from the occasional completely imperforate condition.

The two openings are often not at all regular, but form two unequal fenestræ (hymen bifenestratus); or the membrane may be pierced with holes, forming the cribriform hymen.

The columnar hymen is formed by a thick pillar on its posterior face, which is often a vestige of one of the columns of the vagina, especially the posterior; in the fœtus they are prolonged upon the hymen as are also the rugæ of the vagina (Fig. 143). The hymen is formed by two lamellæ which are always distinct at the fifth month.[30] The external is derived from the vulva and is the fundamental structure of the hymen; the other is an investment from the vagina; these two lamellæ fuse later on, and the posterior face becomes smooth by the effacement of the vaginal folds, while the epithelium of the anterior surface comes from the vestibule.

Atresia of the Hymen.—Whenever the vagina is found occluded by a thin membrane, it is usually supposed that this represents the hymen; it is most often, however, a terminal imperforation of the vagina or an adhesion between its walls, and the hymen, distended by the accumulation of fluid behind it, is simply applied to the membrane, and may be separated from it after evacuation of the hæmatocolpos.[31] Duncan [32] has often found a circular hymen in such cases

where atresia was claimed, and has described an excellent example. Schröder[33] expressly mentions this error, and has discovered at the lower portion of the obturating membrane the opening of the hymen for which it was mistaken. There are cases, however, where the hymen forms a complete septum, as in one reported by Godefroy,[34] where the mucus which accumulated behind it in the vagina of an infant of two months had produced compression of both rectum and urethra.

Cases of the greatest interest have been published which show very clearly the close relation between the different parts of the hy-

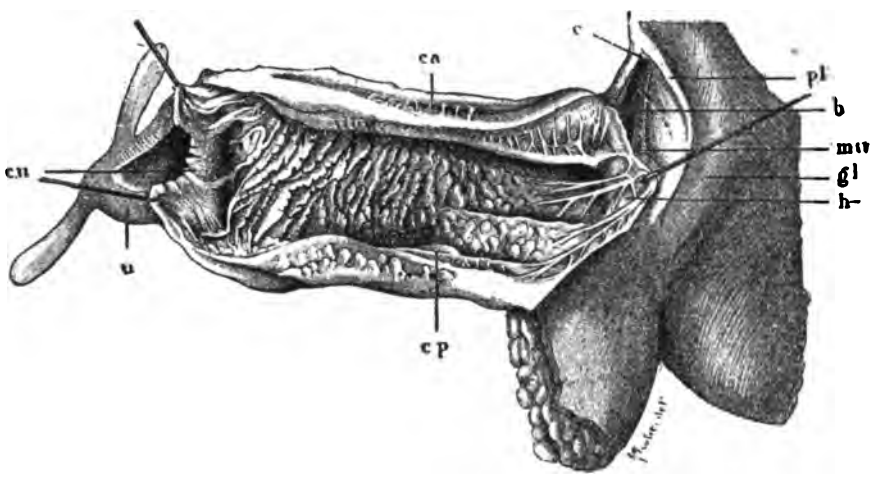


FIG. 143.—VULVA AND VAGINA OPENED ON THE SIDE IN A FŒTUS OF EIGHT MONTHS. The vaginal folds are seen to be continuous with those on the cervix and the posterior surface of the hymen. *ca*, Anterior column of the vagina; *cp*, posterior column; *c*, clitoris; *b*, frænum vestibuli; *pl*, nymphæ; *gl*, labia majora; *mu*, urinary meatus; *h*, hymen; *u*, uterus; *cu*, cervix uteri.

men, and the ring which surrounds the meatus. In the normal condition there is often a prolongation in the form of a valve or uvula which covers the meatus in part, and cases have been observed where there was a very distinct hymen provided with fringes covering the meatus;[35] and at times the hymen has entirely covered this orifice, causing a retention of the urine in the new-born.[36] This is a superficial atresia which might be called imperforate urethral hymen.[37] It should not be confounded with aplasia of all or a part of the urethra which may exist by itself, or with persistence of the urachus which permits the evacuation of the urine.[38]

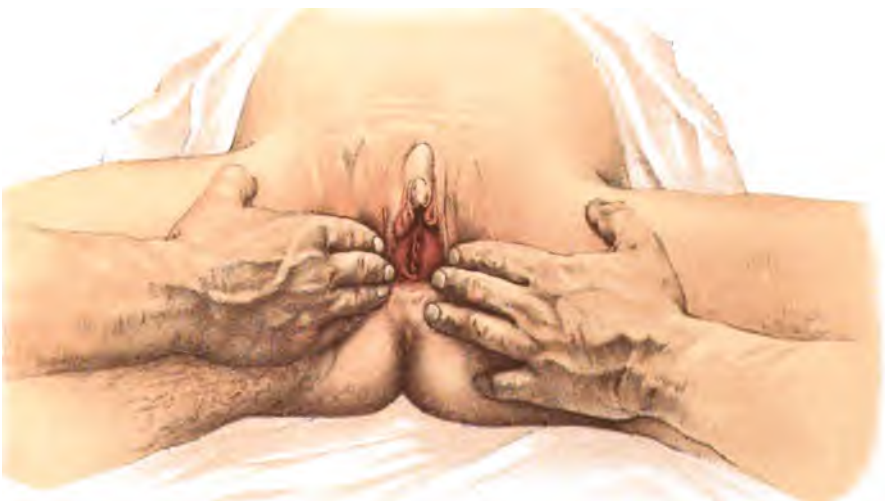
Anomalies of Structure.—The hymen is usually thin and membraniform, apparently formed by the simple apposition of the two lamellæ covered with pavement epithelium, at times fused, at

times perfectly distinct. The variations in structure which it presents are: 1. Increase in thickness, which renders it fleshy without augmenting its tenacity; and 2. A peculiar rigidity, which gives it a sclerous consistency and renders its division with the knife imperative, intercourse in the natural manner being impossible. According to Budin,[39] this rigidity may be the principal factor in laceration of the perineum posteriorly, and an obstacle to the progressive dilatation of the vulva; and on the other hand, the hymen may be so elastic that no laceration can be discovered in it after labor;[40] it has been found intact after abortion at the sixth month;[41] 3. Excessive vascularity of the membrane has caused grave and even fatal hemorrhage at the time of the first coitus.[42] Such cases, difficult of comprehension if we suppose that the hymen is only a fold of the vaginal membrane, become easily understood when we consider it as the organ of the corpus spongiosum (urethro-penile mucous membrane of the male), which has persisted in the embryonic state, and may by anomaly present in the female an erectile tissue like its homologue in the male. Henle has removed all doubt from the latter case, for he found exceptionally an erectile tissue in the hymen.[43]

Congenital Absence.—The older observations of the entire absence of the hymen should be received with doubt; they are all probably erroneous from causes which I have mentioned. Devilliers,[44] Tardieu, and Brouardel[45] have never seen such a case among the large number of infants which they have examined for medico-legal purposes.

HERMAPHRODISM.[46]—True hermaphrodism would be constituted by the presence in one person of the organs of both sexes in a condition of perfect function; I will discuss the pretended cases of this kind further on, and demonstrate their folly. But the appearance of a double sex may arise from malformations of the genitals or their arrest in the embryonic phase in the male, or their excessive development in the female. The individuals of the first category are far more numerous than those of the second, and the great majority of the pseudo-hermaphrodites which have been described have been males with hypospadias. The criterion of the sex in a doubtful case is the presence of the testicles or ovaries, and the great difficulty in determining the sex on the living person is the impossibility of deciding what is the nature of the genital gland placed in the inguinal canal, or hidden within the abdomen.

To present the complete classification of hermaphrodism, it seems



PSEUDO EXTERNAL BILATERAL HERMAPHRODISM.

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useful to establish the following divisions on a practical basis rather than on a theoretical:

1. Partial pseudo-hermaphrodism; certain parts of the sexual organs of both sexes with evident predominance of one. This comprises two varieties, gynandry and androgyny, according as the individual is really male or female.

2. Pseudo-hermaphrodism proper, due to perineo-scrotal hypospadias; the external organs have the embryonic disposition, hence resemble the female; presence of testicles decisive.

3. True hermaphrodism.

Partial Pseudo-hermaphrodism.—A. *Gynandry.*—The external genital organs of the female seem to resemble those of the male when there is hypertrophy of the clitoris (see Krug's [73] case, Plate IX.) with fusion of the labia majora, and perhaps also of the nymphæ, simulating the scrotum and concealing the vulvar opening (Fig. 144). The resemblance is

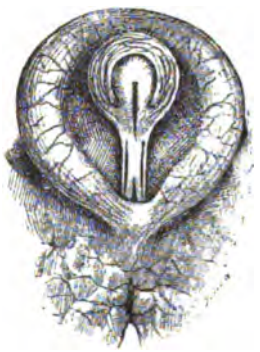

FIG. 144.—PARTIAL HERMAPHRODISM IN A FEMALE BY HYPERTROPHY OF THE CLITORIS (GYNANDRY). The external genitals of a child of three weeks, natural size; specimen deposited in the Museum of Legal Medicine at Vienna, by Hofmann. The integuments show the effects of long action of alcohol. The projecting labia majora surround the clitoris and conceal the vulvar opening. The frænum vestibuli is very large.

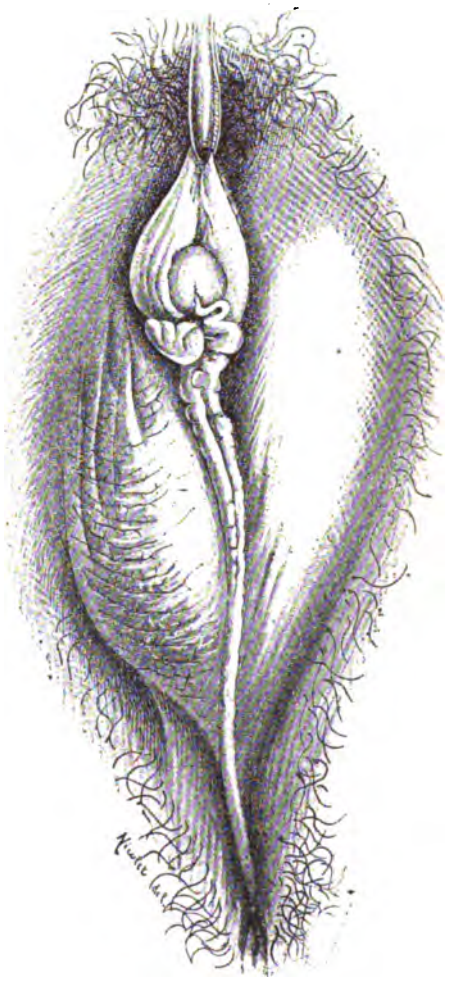

FIG. 145.—PARTIAL PSEUDO-HERMAPHRODISM IN THE MALE (ANDROGYNY). Hypertrophy of the frænum and prolongation along the raphe, with bifid projection simulating the nymphæ. This young subject, named Jan——, presented also hypertrophy of the breasts; the left testicle was atrophied and retained in the ring.

still more striking when there is an ovarian hernia at the anus or into the labium majus.[47] This hypertrophy of the clitoris has often been noticed in women who are addicted to masturbation.

In the case of fusion of the labia, it is at times possible to separate them at birth by gentle traction or the use of a blunt instrument, as one detaches the prepuce from the glans in phimosis. If necessary, we can employ the cutting instrument, if certain of the existence of the vaginal canal behind the cutaneous bridge which is to be divided. This canal and the urinary meatus are then discovered, as in Huguier's case.

The hypertrophy of the clitoris does not change its form, but only its dimensions and those of its prepuce. It may reach a length of 4 or 5 cm. (Huguier). The internal organs of the female are at times irregularly developed.[48]

B. *Androgyny.*—Individuals of this class are frequently monorchid or cryptorchid males who present certain external characters of the female, among others largely developed breasts. Here the type is masculine, the scrotum is fused and surmounted by a perforate penis; but the absence of testicles in the scrotum and the median depression which seems like the space between the labia majora, the large breasts which may be developed as in the female, and lastly, as in a case which I have seen (Fig. 146) the presence of two smaller labia, formed by a crease in the scrotal raphe, give the individual a very feminine aspect.[49] The development of the breasts, a frequent corollary in the male of arrested development of the genital organs, is a fact of organic sympathy which is inexplicable, but it is of great interest in connection with the facts of the physiological relations of these organs. The mammary hypertrophy, when it is manifested in a case where the genital deformity does not resemble a vulva, becomes the prominent trait of pseudo-hermaphrodism.

Pseudo-hermaphrodism Properly so called.—These cases[50] comprise the great majority of those reported. They are usually men with hypospadias where there is a perineo-scrotal fissure,[51] and numerous autopsies have determined their exact signification. I have described three cases from the living individual,[52] and all three were built upon exactly the same plan, in accord with cases described by my predecessors. These persons are generally regarded as of the feminine sex at their birth, are registered as girls, and are dressed and educated as of the female sex. Many of them have been married, and nearly all were able to have intercourse with their husbands by the

urethral orifice, which was transformed into an infundibulum, rather than by the depression which existed below; but at the same time, many of them have had a taste for women and performed a more or less complete coitus. In some of these cases there was the appearance of irregular menses from hemorrhages of the dilated and irritated

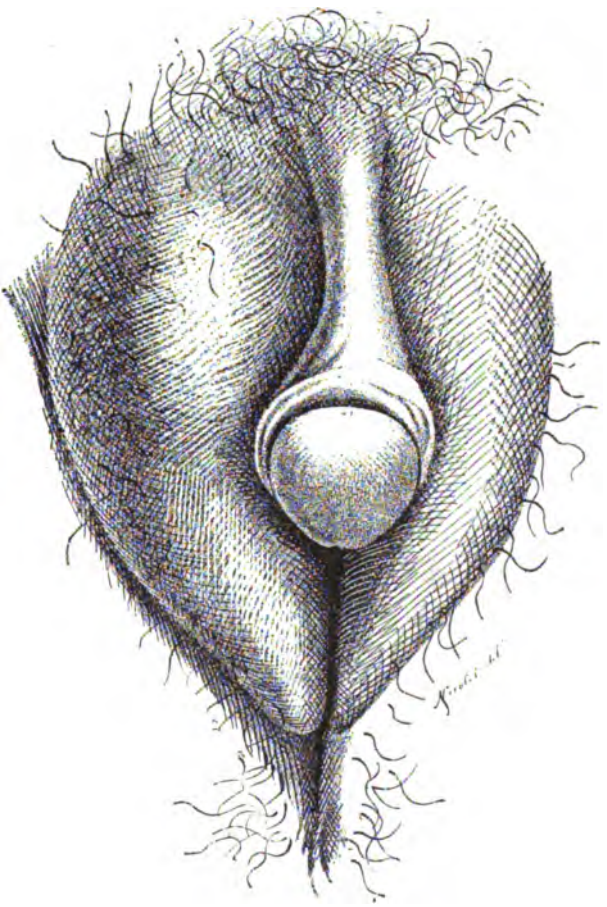

FIG. 146.—PSEUDO-HERMAPHRODISM PROPER, BY HYPOSPADIAS. External genital organs of Julie D. (man). Masculine appearance of the parts with the penis depressed and the thighs together.

urethra;[58] but there are other cases where there was undeniable evidence of menstruation, although feeble and intermittent, and the anatomical condition of the parts was fully explanatory of the fact.

The external conformation resembles that of an embryo seen through a magnifying glass; the penis projects or is fastened to the pubes and maintained below by a frænum; the glans is as large as in the child or youth, and is imperforate, but its extremity is marked by

a groove with a fleshy band prolonged from its inferior part toward the perineum. This bridle, well described by Bouisson from a surgical point of view, and which I have shown to be homologous with the frænum vestibuli of the female, extends from the glans to the urinary meatus, situated 1 or 2 cm. below the root of the penis. The vulvar orifice is found below this, of varying size, but usually so narrow that the finger is introduced only with difficulty.

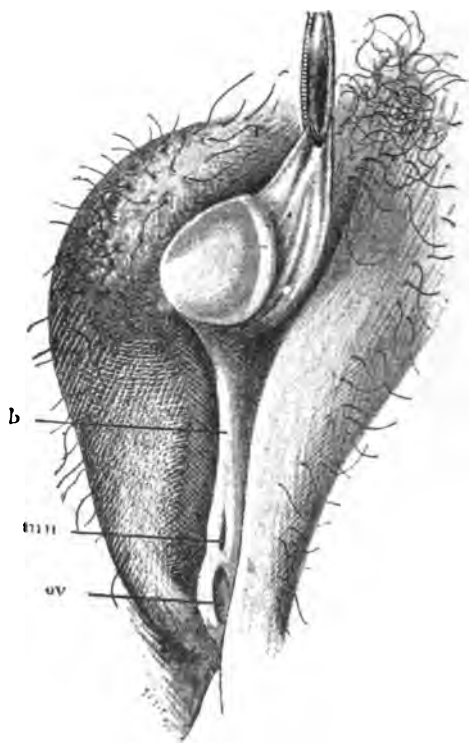

FIG. 147.—PSEUDO-HERMAPHODISM PROPER. External genitals of Julie D. (man). Feminine appearance of the parts with the penis raised and the thighs separated. *b*, Frænum; *mu*, meatus; *ov*, vulvar orifice.

A perfectly formed hymen may exist at the vaginal opening, as I have seen in two cases.[54] It is maintained intact owing to the hyperæsthesia which is often found in the parts. The vagina varies in extent up to 10 cm.[55] The Müllerian canals may reach the same complete development in the male in cases of malformation of the external genitals.

In the pathological museum at Würzburg there is a specimen described by Franque[56] where there are the external organs of the male (hypospadias?), and above them a vagina opening into the prostatic

portion of the urethra, as well as a uterus and oviducts, both well developed. Zweifel cites a case where at the autopsy of a child of six months there was found a hypospadias with testicles, but also Müllerian canals completely developed into vagina, uterus, and tubes.

Ahlfeld has collected several similar cases. It is in the interior of

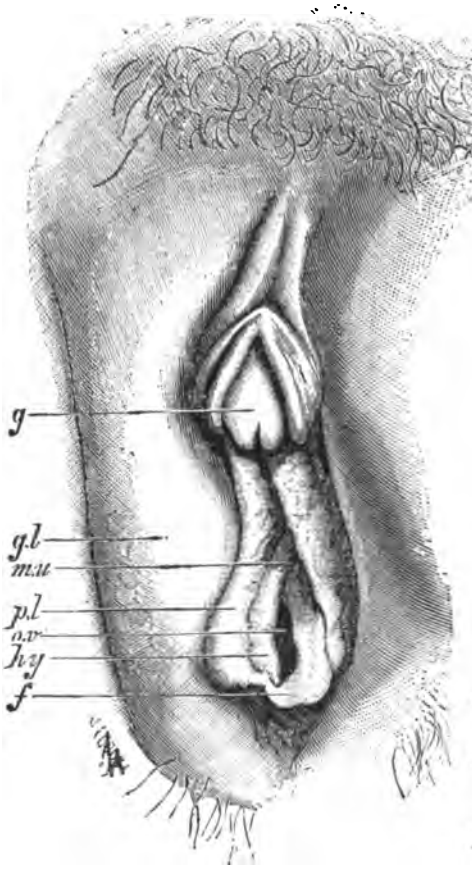

FIG. 148.—PSEUDO-HERMAPHRODISM PROPER, BY PERINEO-SCROTAL HYPOSPADIAS. External organs of Julie D. (man).

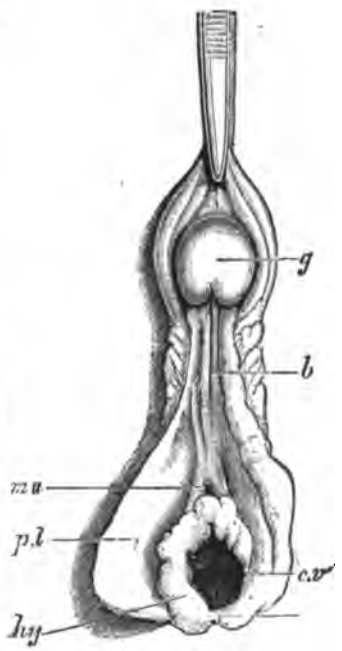

FIG. 149.—DETAILS OF THE HYMEN AND FRÆNUM VESTIBULI IN THE SAME SUBJECT. *g*, Glans; *gl*, labia majora; *pl*, nymphæ; *mu*, meatus; *ov*, vulvar orifice; *hy*, hymen; *f*, fourchette.

this canal that ejaculation occurs at the moment of orgasm.[57] During erection the penis is held in a curved position by the bridle.

The prepuce is open below and is disposed as in the case of the clitoris; there are rudimentary labia minora and well-marked labia majora. The testicles are always rudimentary and secrete a semen which is sterile like that of cryptorchids; at times they descend, at other times they remain at the ring or within the abdomen.

The development of the breasts is often feminine, as also the appearance of the buttocks and thighs, where the panniculus adiposus is usually very thick. The larynx does not project and the voice is womanish; the pelvis is masculine and the beard is either very scanty

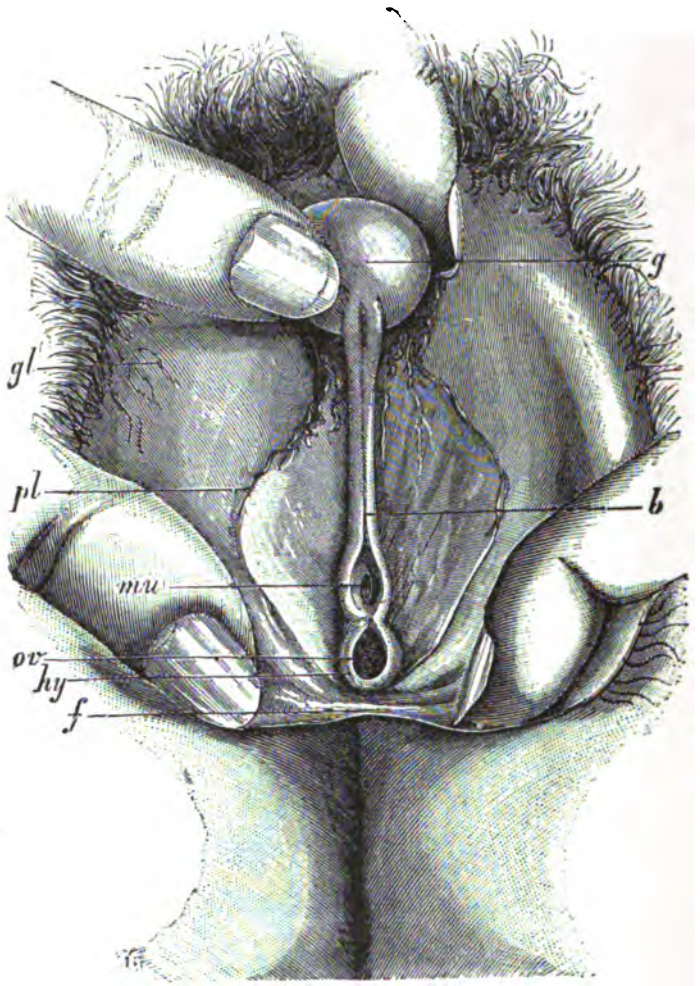

FIG. 150.—PSEUDO-HERMAPHRODISM PROPER. External organs of Louise B. (man). *g*, Glans; *b*, frænum; *ov*, vulvar orifice; *hy*, hymen; *f*, fourchette; *pl*, nymphæ; *gl*, labia majora.

or well grown; and when the latter character accompanies well-developed breasts, the case is particularly striking. Ordinarily, rectal touch and the use of the catheter fail to discover any trace of a uterus, or generally of a prostate, and bimanual palpation does not reveal the presence of ovaries.

These individuals are of feeble spirit or, if intelligent, are not well balanced;[58] their antecedents are often marked by nervous phenomena; and the coincidence of similar deformities in the same family has been observed.[59]

True Hermaphrodism.—Although admitted without hesitation by the older writers, who have instanced a number of examples, the existence of true hermaphrodism is to-day strongly contested.

Klebs offers the following theoretic classification of true hermaphrodites:

1. Bilateral, where there is a testicle and an ovary on each side; also termed vertical hermaphrodism.

2. Unilateral, where there is a testicle and an ovary on but one side.

3. Lateral, where on one side there is a testicle and on the other an ovary.

The first two varieties may be quickly dismissed; no case of unilateral hermaphrodism has ever been seen; only two cases of the bilateral have been observed, and these are more than doubtful; the third variety has received the credence of late writers, it seems to me unnecessarily, and therefore shall be considered at length.[60]

A real importance can be accorded to a case only when it has been controlled by autopsy; the case of Katharina Hohmann,[61] so often cited, was not thus controlled, as has been wrongly asserted. It is easily seen by the details of the case that it was one of pseudo-hermaphrodism by perineo-scrotal hypospadias. The right testicle alone had descended into the labium. The subject claimed to have a regular menstrual discharge, but it was discovered too late that the pretended menses were the result of a trick.[62] Rokitansky, thus deceived, concluded that the menstruation was real, and imagined the presence of ovaries and Graafian follicles—in other words, supposed that he had found a case of true hermaphrodism. The breasts in this case were developed like a woman's.

The well-known subject of Heppner's, of St. Petersburg,[63] has been cited as conclusive proof of the existence of true hermaphrodism by the partisans of this idea, and at first sight it seemed incontestable, but on close examination the doubt was removed. The case was one of an infant of two months with the external organs of the female or of perineo-scrotal hypospadias. The uterus, tubes, and ovaries were well developed on each side, and there was an additional gland which resembled a testicle. Between the fundus and the ovary there was a parovarium or the shrivelled Wolffian body attached to the sup-

posed testicle. Under the microscope this indeterminate body showed a number of tubes directed toward a hilum, with hyaline walls, which gave no striæ or nodules with acetic acid; there was no vas deferens. Upon these elements Heppner based his opinion that it was a testicle. Slavjansky declared that he was not convinced that it was not an ovary. Beigel has quite frequently found supernumerary ovaries. As regards this question, it is well to remember that the primitive condition of the ovary so closely resembles that of the testicle that it is a matter of the greatest delicacy to decide between them (Zweifel).

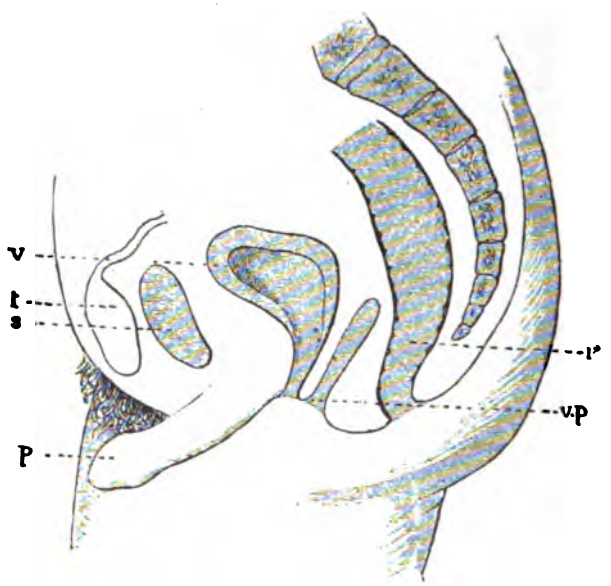

FIG. 151.—PSEUDO-HERMAPHRODISM PROPER, BY PERINEO-SCROTAL HYPOSPADIAS (ZWEIFEL). Diagrammatic figure of the deep connections. *v*, Bladder; *vp*, prostatic vesicle (pseudo-vagina); *r*, rectum; *p*, penis; *s*, symphysis; *t*, testicle.

The autopsy of the pretended hermaphrodite (lateralis vera) of Meyer is open to the same objections.[64] The small body which resembled an ovary, and was found on the left side, was probably an atrophied testicle; the large cells discovered in it were without doubt male ova; it was impossible to find any Graafian follicles.

These three cases are the chief examples which are supposed to prove the existence of true hermaphrodism. I will not stop to discuss others, which are too old to have any value from a histological standpoint, or too incomplete to be believed.[65]

As a matter of fact, then, there is actually one single case of true hermaphrodism, where testicles and ovaries coexist. This anomaly does not seem improbable *a priori;* it is frequent in the batrachia,[66]

and almost the rule in the toad; but it is rare in the higher vertebratæ. True hermaphrodism has, however, been found in the goat[67] and the pig;[68] hypospadias with pseudo-hermaphrodism has been observed more frequently, and I have seen an excellent example in the dog.

Treatment.[69]—These various malformations which I have mentioned are of more interest for the anatomist than for the surgeon, and interference is seldom opportune.

The fusion of the labia may be remedied by traction or the knife.

Hypertrophy of the labia and clitoris may require amputation of the excess of tissue, especially if the friction of the clothing is painful. The operation may be performed under cocaine with the knife, and the hemorrhage controlled with the hæmostatic suture or forcipressure or the thermo-cautery applied to the corpus cavernosum of the clitoris.

In epispadias, the parts may be sutured after freshening their edges according to the shape of the orifice, as Roser,[70] Schröder, Richelot,[71] and Dohrn[72] have done. In one case Testelin occluded the canal which existed above the urethra by means of caustic potash, but it is not advisable to adopt this method.

Malformations of the hymen may require incision or partial excision.

Pseudo-hermaphrodism may perhaps give rise to surgical indications. In one case which I saw, the erection of the penis was much interfered with by the frænum, and the patient requested me to destroy it. A simple section seemed insufficient, and I decided upon excision of the bridle and autoplastic repair; but when I proposed to perform the operation, the patient refused to allow it.

BIBLIOGRAPHY AND NOTES.

1. Rathke: Abhandl. zur Entwickel., 1832, vol. i., p. 57. The formation of the perineum entirely by the median fold was first described after the plan of development of the rabbit. The existence of a rhaphé which is prolonged to the scrotum and the sheath of the penis is in favor of Rathke's ideas. Kölliker (Embryologie, French transl., 1882, p. 1,040) and Mihalkovics (Journ. Intern. Mens. d'Anat. et d'Histol., vol. ii., p. 310) admit the mixed formation at the expense of both median fold and lateral portions. Tourneux (Journ. de l'Anat. et de la Phys., Sept., Oct., 1888, and Bull. Soc. de Biolog., Feb. 8th, 1890, p. 75) adopts the theory of the vertical perineal fold exclusively. His researches were made on the embryo of the sheep. He distinguishes two stages in the descent of the perineal fold: 1st, the depression of the median fold within the cloacal cavity; 2d, the gliding of the cloacal loop along the cloacal plug (Tourneux thus designates the large epithelial mass which is formed by the union of the ectoderm with the entoderm, limiting the cavity of the cloaca anteriorly). The cloacal cavity becomes obliterated finally

by the fusion of this cloacal plug with the anterior surface of the perineal projection. E. Ritterer (Bull. Soc. Biolog., Jan. 4th, 1880, p. 3; Journ. Anat. et Physiol., 1890) has reached different results from the study of pig and rabbit embryos, employing celloidin as in M. Duval's method, to preserve the natural position of the parts. The cloacal fold descends, as many observers have asserted, but this results from the median fusion of the two lateral folds from the cloaca. The single fold owes its existence solely to the union of the lateral folds and forms the urethro-rectal septum—a process like that of the closure of the medullary furrow by the apposition and fusion of the medullary folds. Thus the cloacal closure and the formation of the perineum may be as described by Rathke, but instead of the five folds admitted by this author, the whole process is reduced to the two lateral folds.

2. The corpora cavernosa develop in intimate connection with the bones of the pelvis and are at first absolutely double. The prepuce appears toward the sixth month. According to Bokai, the glans and the prepuce are at first adherent, which accords with congenital agglutination of the labia minora in the female as sometimes occurs. The prostate appears at the third month and by the end of the fourth has become very prominent. It represents at first only a thickening where the urethra and the genital cord meet at the commencement of the uro-genital sinus; the glands are formed during the fourth month.

3. S. Pozzi: Annal. de Gyn., April, 1884. Cong. Internat. des Scien. Méd. de Copenhague, Comp. Rend., 1884, vol. i., p. 67. See on the same subject Guinard: Paris Thesis, 1886. Picqué: Encycl. Internat. de Chir., French edition, vol. vii. Issauriat: Le Sinus Uro-génital. Paris Thesis, 1888, No. 319.

4. Deutsch: Neue Zeit. f. Geb., Bd. xxx. Heppner: Petersb. med. Zeit., 1870, Bd. i., p. 204. Rizzoli: Dell' Ano Vulvara. Mem. dell' Acad. d. Sci., Bologna, vol. v., 1875. Massari: Wien. med. Woch., 1879, No. 33. Rovillain: Contrib. à l'Étude Vices Conform. de l'Anus, etc., Amiens, 1872. Winternitz: Prag. med. Wochens., 1883, Bd. vii. Aveling: Lancet, 1884, vol. ii. Jacubowitz: Arch. f. Kinderk., 1886, Bd. viii. Hadra: Berlin. klin. Woch., Bd. xx.

5. Cases where the rectum and anus are normal and yet communicate with the vagina are very rare. Joseph: Beitr. z. Geb. und Gyn., Band iii. Caradec: Gaz. des Hôpit., 1863, No. 7. In the latter case the fistula is described as opening below the vulva, but this is probably an error in interpretation; it was more likely a second vagina, rudimentary and communicating with the rectum, as L. Mayer remarks (Beitr. z. Geb. und Gyn., Bd. iii.). See also P. Reichel: Die Entwickel. des Dammes und ihre Bedeutung, etc. Zeit. f. Geb. und Gyn., Bd. xiv., Heft 1, 1887. A. V. Rosthorn: Unvollkom. Kloakenb. Wiener klin. Woch., No. 10.

6. Mosengeil: Archiv f. klin. Chirurg., 1870, Bd. xii., Heft 2. Lebedeff: Ueber Hypospad. beim Weibe. Arch. f. Gyn., Bd. xvi., p. 290, 1880.

7. Gosselin: Gaz. des Hôp., No. 37, March, 1851. A. Herrgott: De l'Estrophie Vésicale, Paris, 1874. Kleinwächter: Monat. f. Geb., Bd. xxxiv., p. 81. Testelin: Gaz. Méd. de Paris, 1861, No. 46. Nunez: Paris Thesis, 1882. Guinard: Paris Thesis, 1886. Emmet: La Pratique des Malad. des Femmes, French trans., Paris, 1887. Richelot: Union Méd., March, 1887. Dohrn: Zeit. f. Geb. und Gyn., 1886, Bd. xii., Heft 1. Möricke: Zeit. f. Geb. und Gyn., Bd. v., p. 324, 1880. R. Frommel: Ibid., Bd. vii., p. 430.

8. Klebs: Handbuch d. Path. Anat., Bd. i., Abth. i. Ahlfeld: Die Missbild. der Mensch., Abth. 2, p. 222. Schröder: Zeit. f. Geb. und Gyn., Bd. v.

9. Henle: Zeitschr. f. rat. Med., Bd. vi., p. 343. Albrecht: Sur la Signification Morphol. du Pénichisis, etc., in 15th Congress of German Surgeons, Berlin, 1886. This author presented considerations full of originality and of great importance from the standpoint of philosophical anatomy, as regards the interpretation of malformations, noticing the analogies of atavism with the normal disposition of

the parts in the lower vertebrates, *e. g.*, the two half penes in the selachians; and proved also that the terms ventral and dorsal as applied to the penis should be reversed.

10. Sécheyron: Abouche. Anorm. de l'Urèt., etc. Arch. de Tocol., April, May, 1889. The ureter may also open into the rectum; see Jeannel: Rev. de Chirurg., April, 1887.

11. Debierre: Sur les Canaux de Gärtner. Compt. Rendus Soc. Biolog., May 22d, 1885.

12. The ureter may in this case remain imperforate (Sécheyron) when it is probable that the kidney will be atrophic or cystic.

13. Foville: Bull. Soc. Anat., February, 1856.

14. De Villiers: Arch. de Tocol., May, 1890, p. 272. A case of total absence of the nymphæ, the clitoris covered with a fibrous adhesion from the labia majora, which were very atrophic. See also Auvard: Travaux d'Obst., 1889, ii., p. 533.

15. R. Blanchard: Étude sur la Steaopygie, etc. Bull. Soc. Zool. de France, 1883, pp. 15–75.

16. Bokai: Ueber Atresia der Schamspalte bei Kind. Jahrbuch f. Kinderk., N. F., Bd. v., pp. 26 and 163, 1872.

17. S. Pozzi: De la Bride Masc., etc. Bull. et Mem. Soc. Biolog., January 26th and February 16th, 1884. Gaz. Méd. de Paris, February 23d, 1884. Annal. de Gyn., April, 1884. Sur une Partic. Méconnue des Organ. Gén., etc.; Cong. Intern. des Sci. Méd., Copenhagen, 1884; Comptes Rendus, vol. i., p. 67. I insist on these dates on account of the singular omission that they are not cited in the analysis of a memoir published after many of mine by O. Küstner of Jena: Das Analogon des Corp. cavern. ureth. beim Weibe, read May 23d at the Soc. of Med. and Nat. Hist. of Jena. Centr. f. Gyn., January 10th, 1884.

18. Ledru: De la Memb. Appelée Hymen. Paris Thesis, 1855. F. Roze: De l'Hymen. Strasburg Thesis, 1865. Henle: Handb. der Anat.; Eingeweidelehre. Budin: Recherches sur l'Hymen, etc. Bull. Soc. Biol. and Prog. Méd., 1879.

19. One proof of the independence of vagina and hymen is the fact, many times observed, of the existence of this membrane in total absence of the vagina. How shall the part exist if the whole be suppressed? It is, therefore, unjust to challenge, as Dohrn did (Die Bildungsfehler des Hymens, in Zeitsch. f. Geb. und Gyn., Bd. xi., Heft 1, 1884), the case of Hofmann's (Gericht. Med., p. 115) relative to a hymen provided with three openings found in a case of total absence of the vagina; as also in my own experience, where there was a perfectly developed circular hymen and no vagina (Bull. Soc. Biolog., Feb. 16th, 1884). Since then numerous cases have been published. See Grohe's Institut (Greifswald) cited by Winckel: Lehrb. der Frauenkr., 1856, p. 80. Bruns: Centr. f. Gyn., 1888, p. 366. Zweifel: Obstet. and Gyn. Soc., Leipsic, January 21st, 1889. Centr. f. Gyn., 1889, No. 25. Las Casas de Santos: Zeitschr. f. Geb. und Gyn., Bd. xiv., Heft 1, pp. 151 and 153. The latter author observed three cases of absence of the vagina with a well-formed hymen, in Schröder's service. These later cases should no more be neglected than the two early ones which Dohrn challenged. As I will show farther on, the hymen has been found in the hypospadias of the male and its connection with the subpenile bridle, the result of the aplasia of the corpus spongiosum, rendered its true affinities evident.

20. A. Doran: Handbook of Gyn. Operations, 1887, p. 4.

21. Turnipseed: Amer. Journ. of Obstet., 1877, vol. x. According to Bischoff (Abhand. der K. bayer. Akad., 1879), the hymen is lacking in the anthropomorphic apes, and the vestibule is very deep.

22. Krimer: Hufeland's Journ., Sept., 1834.

23. Breisky: Deutsch. Chir., Lief. 60, 1886.

24. Sänger (Arch. f. Gyn., Bd. xxxvi., Heft 3) has observed obliteration of the vagina at its lower third, by a membrane situated 4 cm. above the hymen, in which a very small opening was discovered with difficulty; the woman was seven months pregnant. The membrane was excised and the pregnancy continued.

25. Fristo: Gaz. des Hôpit., 1861, No. 96.

26. The corpus spongiosum of the urethra is formed by the erectilization of the deep layer of the urethral mucous membrane. Now with what has been said of the homology of the organs in the two sexes, and of the method of displaying the same by splitting and elevating the penis, it is evident that the mucous membrane of the pendulous portion of the penis should extend in the female from the meatus to the clitoris, which is precisely the situation of the frænum of the vestibule which has been considered as the exact homologue of the superior part of the penile portion of the urethra in the male; of the same fibro-elastic structure also. I have employed the term "organ of the corpus spongiosum" in order to have a common name for the organ from which are formed the erectile tissue of the corpus spongiosum in the male and the bulb in the female, which are similar organs in the two sexes. It would be interesting also to find the mode of erectilization of the bulb of the vagina in the female embryo and its connection with the hymen.

27. J. Heitzmann: Abnorme Bildung des Hymens. Wien. med. Presse, 1884, xxv., p. 242. Dohrn: Die Bildungsfehl. des Hymens. Zeit. f. Geb. und Gyn., 1884, Bd. xi., Heft 1. Courty (loc. cit. [35], p. 112) reproduces many figures from the theses of Roze and Ledru.

28. Luschka: Zeit. f. rat. Med., Bd. xxvi.

29. Other observations are still more convincing and demonstrate the independence of the Müllerian ducts and the hymen, even where there is a septum. Breisky has seen traces of a vaginal septum which was altogether separate from the hymen. Corazza (Schmidt's Jahrb., cxlviii., p. 148) in a case of double vagina observed a single hymen placed 1 mm. in front of the septum. Winckel (Lehrb. der Frauenk., p. 246, 1886) reports an analogous case.

30. O. Schaeffer: Bildungsanomal. weibl. Geschlechtsorg. Arch. f. Gyn., 1890, Bd. xxxvii., Heft 2.

31. Corazza: Schmidt's Jahrbuch, cxlviii., p. 148.

32. Duncan: Trans. Obst. Soc., vol. xxiv., 1882.

33. Schröder: Mal. des Org. Génit., French trans., 1886, p. 46.

34. Godefroy: Gaz. des Hôpit., 1856, p. 142. In the fœtus the vagina is filled with epithelial débris.

35. See the figure given in Gallard, of one of Luschka's cases (Leç. Clin. sur les Malad. des Fem., 1879, p. 113), and of a case of Ledru in Courty (Traité Prat. des Mal. de l'Utér., 1879, p. 112).

36. Bohmer: Observ. Anat. Rar., Fasc. ii. M. N. Tucker: Die regelwidr. Geb., 1826, p. 235. C. Robin: In Dict. of Nysten, article Membrane, 1855.

37. S. Pozzi: Soc. Biolog. and Copenhagen Cong., 1884, as cited. O. Schaeffer: Loc. cit.

38. Cabrol operated in 1555, at Beaucaire, on a young girl who presented this anomaly. See also Middleton: Amer. Jour. Med. Sci., Jan., 1868, p. 79.

39. Budin: Sem. Méd., March 9th, 1889.

40. Budin: Deux Petit. Fis. de l'Hymen dans une Primip., etc. Prog. Méd., 1887, No. 48.

41. Tolberg, cited by Dohrn: Loc. cit.

42. Winckel: Lehrbuch der Frauenk., 1886, p. 80. L. Aschen: Ein Fall von hochgrad. Blutung, etc. Prag. med. Woch., 1889, No. 3. The bleeding was very abundant; arrested by tampon; caused by laceration of the hymen slightly involving the left nympha and the navicular fossa.

43. Vide 26, remarks on the corpus spongiosum; also Guinard: Comp. des Org. Génit. Ext. dans les deux Sex. Paris Thesis, 1886.

44. C. Devilliers: Nouv. Recherch. sur la Memb. Hymen, etc. Revue Méd., 1840, vol. ii.

45. Brouardel: Causes d'Erreur et Régles Expert. dans les Affair. d'Attentat à la Pud. Gaz. des Hôpit., Sept., 1887, p. 881. Memb. Hymen, son Examen, etc. Ibid., p. 901.

46. The word hermaphroditism would be more correct.

47. Eschricht: Müller's Arch. f. Anat., 1836, Heft 2. Bouillaud and Manec: Jour. Univ. Hebd. de Méd. et de Chir., etc., Paris, 1833; with an autopsy. Debout, in Le Fort: Vices de Conform. de la Vulv., etc. Paris Thesis, 1863. J. Marzo: Annal. d'Hyg. et de Méd. Lég., 2d series, vol. xxv., 1866; doubtful case. J. Simpson (Collected Works, vol. ii., p. 407) describes a little girl with apparently male organs observed by Ramsbotham, Med. Gaz., xiii., p. 184; with demonstrative autopsy; Hart and Barbour: French trans., 1888, p 584. Hofmann has published (Wien. med. Jahrbuch, 1877, Heft 3, p. 24) a case analogous to that given in fig. 144. The latter is deposited in the Museum of Legal Medicine at Vienna, labelled "excessive development of the clitoris"; from a child of rachitic constitution who died at three weeks of capillary bronchitis; internal genitals normal; no other deformity.

48. Jeannel (Bull. Soc. Chirurg., 1887, p. 505) reports a case where there was a bicorn uterus and a hypertrophied clitoris. In the autopsy of Bouillaud's case, made by Manec, the presence of a prostate is spoken of about the end of the vagina which received and contracted the vagina, which did not open by itself in the vulva; this condition is essentially masculine, but the absence of a microscopic examination leaves us in some doubt as to the nature of the pretended prostate. The interpretation of the case is defective in another point: it was not the vagina which opened in the urethra, but the urethra and the vagina together opened into the vestibular canal, a vestige of the uro-genital sinus (see fig. 139, 4).

49. S. Pozzi: Note sur deux Nouv. Cas de Pseudo-hermaph. Mém. Soc. Biol., 1885, pp. 21-29, case No. 1.

50. Transverse hermaphrodism has been described as the term applicable to cases where the external organs belong to the one sex (almost always female) and the internal to the other. They usually are cases of perineo-scrotal hypospadias in the male.

51. On hypospadias in the male see Bouisson: Tribut à la Chir., 1868, vol. ii., p. 500. Guyon: Thesis, 1863.

52. S. Pozzi: Bull. Soc. Biolog., January 26th, 1884. Mém. Soc. Biolog., 1884, and 1885, pp. 21-29. Bull. Soc. Anthropolog., December 5th, 1889, vol. xii., 2d ser., p. 602.

53. Case of Ernestine G., presented by Magitot (Bull. Soc. Anthropol., 1881) and of Adele H., which I presented before the same society (ibid., December 5th, 1889, p. 602.

54. S. Pozzi: Loc. cit. (52). Sänger presented before the Obstet. and Gyn. Soc. of Leipsic, January 21st, 1889 (Centr. f. Gyn., 1889, No. 25), a pretended female who was remarkably large and, although married, had all the attributes of masculine hypospadias, as Zweifel declared; at the vulvar orifice there were the remains of a crescentic hymen.

55. Marchand: Ein neuer Fall von Hermaphrod. Virchow's Archiv, Bd. xcii., p. 286. On the uterus masculinus see Ahlfeld: Missbild., ii. Ab., p. 250, and an important autopsy published by A. Pozzi and P. Grattery (Pseudo-hermaph., in Prog. Méd., 1887). One of the interesting features of the case is the structure of the frænum; under a mucous investment there was erectile tissue.

56. Franqué: Scanzoni's Beiträge, Bd. iv., cited by Kölliker: Embryolog., French trans., 1882, p. 1,043.

57. The vas deferens of one side has been seen to open by the meatus at the side of the pseudo-vulva. Dohrn: Ein verheirat. Zwitter. Archiv f. Gyn., 1883, p. 225.

58. The importance of malformations of the genital organs (micro-orchidia, cryptorchidia) for the development of mental disease has been described by Christian: Annal. Médico-psychol., ser. 1, 40th year, p. 126, and Étude sur la Melanchol., observ. 39, p. 135; and also by L. du Saule: Les Signes Physiq. des Folies Rais., p. 15. Raffegeau: Du Rôle des Anom. des Org. Gén. dans le Devel. de la Folie, etc. Paris Thesis, 1885. Magnan: Des Anomal. des Aberrat., etc., communicated to the Acad. Méd., January 13th, 1885. Prog. Méd., 1885. Trois Cas de Conform. Vicieuse des Org. Gén. Bull. Soc. Anthrop., February 17th, 1887. Some of these patients have been crazy. Alexina B., who was the subject of a remarkable memoir by Tardieu (L'Identité dans les Rapports avec les Vices de Conform., etc., Paris, 1872), committed suicide. Complete account of the autopsy given by Goujon: Jour. Anat. et Phys. de l'Homme et des Anim., 1869, p. 599. It was a case of male hypospadias.

59. Luigard: Lancet, 1884, vol. i., p. 16. See also the curious genealogy of the family of Jan. Motet: Mém. Soc. Biol., 1885, p. 24.

60. Laugier: Art. Hermaphrodism in Dict. de Médic. et de Chir. Pratique of Jaccoud. A. Guinard: Thesis, 1886.

61. Rokitansky: Ein Fall von Hermaph. vera later. Allg. Wiener med. Zeit., No. 27, 1868. The article has been completely, but incorrectly, translated in Union Méd., 1868, p. 498. On the same case see also Allg. med. Cent. Zeit., Berlin, 1868, and Virchow's Arch., Bd. xliii. and xlv.

62. Ahlfeld remarks on the tendency which these individuals have to deceive the physician. Catharina H. had a nose-bleed every month which she (he) used for the purpose anointing the genitals with blood.

63. Heppner, Reichert: Dubois' Arch., 1870, p. 687. Analysis by Denmic in Gaz. Méd. de Paris, 1872, p. 29. This case has often been incorrectly reported. The specimen had been for many years in alcohol.

64. H. Meyer, of Zurich: Ein Fall von Hermaph. later. Virchow's Arch., 1857, p. 420. Klebs: Handbuch der path. Anat., Berlin, 1876. For a detailed criticism of this case see J. Garrigues: Amer. System of Gyn., edited by Mann, vol. i., p. 273.

65. Berthold (Abhand. königl. Gesellsch. Göttingen, Bd. ii., p. 104, 1845) has described a new-born child with hypospadias, a testicle on one side, a pretended ovary on the other; this latter was certainly an atrophied testicle, for it was impossible to find any follicles in it. Banon: Dublin Medical Journ., vol. xiv., p. 75. Same remarks as above. See on this case Ahlfeld; for other cases of old date see Maret, Varocler, Rudolphi, Stark, Barkow, Gruber, Klotz. In the Musée Dupuytren there are two specimens relating to the same number of cases of true hermaphrodism; No. 264 is a wax model, by Lemmonnier, of the external organs; No. 265 is a reproduction in wax of the internal organs after autopsy; the notice accompanying them is expressed thus: "To a complete female genital apparatus there are added two testicles and two deferent canals which take the place of the round ligaments." It seems to me only a case of double hernia of the ovaries into the labia majora. Houel, the curator of the museum, whose advice I requested on the specimen, described it as "simple imagination." Specimen No. 267B is thus labelled: "Neuter hermaphrodite, Angélique Courtois (dissection in alcohol). This hermaphrodite, observed by M. Follin, is a man as regards the external organs, a woman by the internal, and both man and woman by the deeper

organs." Follin: Gaz. des Hôpit., December 4th, 1851. The case appears to me simply a hypospadias with an atrophied testicle.

66. An ovary and a testicle are often found on the same side in the fish called serranus, less often in the herring and the cod, etc. True hermaphrodism is the rule in the toad (Bufo vulgaris) and it is very common in the frog (Rana temporaria). In the latter a testicle has been found in the male, surmounted by an adipose body on each side, with a duct which was both ureter and vas deferens; seminal vesicles existed, as well as Müller's canals. The latter, which in the female become large oviducts, in the male form delicate bands which prolong the seminal vesicles up to the lungs (Bland Sutton). The seminal vesicles of the frog seem like dilatations of Müller's ducts, but they really are part of the Wolffian duct. In the toad, between the testicle and the adipose body, there is a small body called the organ of Bidder, and according to recent writers this organ is a rudimentary ovary and seems to have an important influence on the high degree of development of the Müllerian ducts of the male. In the male frog the Müllerian ducts are hardly visible, but by anomaly the male frog often presents an organ of Bidder by the side of the testicle—that is, an ovo-testis, and at the same time the Müllerian duct may be largely developed; the latter seems to be in direct relation with the organ of Bidder. J. B. Sutton: Dis. of the Lower Animals. Trans. Path. Soc. London, 1885, pp. 509, 510. A. F. Kent: A Case of Abnorm. Devel. Reproduct. Org. in the Frog. Jour. Anat. and Phys., June, 1885, vol. xix., part iv.

67. F. Schnopfhagen: Wien. med. Jahrb., 1878, Heft iii., p. 341.

68. Kölliker: Ueber einige Fälle von Hermaph., etc. Cong. Périod. Internat. des Sci. Méd., 8th session, Copenhagen, 1884, Compt. Rend., vol. I., p. 47. Two of these cases were simple hypospadias in the male, with a vagina and a large bicorn uterus and imperforate tubes. In a third case there was true lateral hermaphrodism (one testicle and one ovary), bicorn uterus, and external organs of the female type. J. Reuter: Inaug. Dissert., Würzburg, 1884.

69. For the operation necessary in vaginal atresia of the anus, I refer to treatises on general surgery.

70. Roser: Wurtemberg Correspondenzblatt, June 12th, 1861.

71. Richelot: Union Méd., March, 1887, No. 31.

72. Dohrn: Zeit. f. Geb. und Gyn., 1886, Bd. xii., Heft 1.

[73. Krug: Am. Jour. of Obst., Jan., 1891. The physical characteristics of this patient were strongly masculine; the external genitals resembled those of a male, being very similar to those shown in Fig. 148. There was a small uterus; the apparent ovaries were the seat of sarcomatous degeneration for which a laparatomy was done, the patient dying on the second day of pneumonia.]

CHAPTER XXV.

MALFORMATIONS OF THE VAGINA AND THE UTERUS.

MÜLLER'S ducts form the entire genital canal, vagina, uterus, and tubes; the vagina and the uterus develop from the inferior segments of these ducts enclosed between the uro-genital sinus and the insertion of Hunter's ligament in the Wolffian body. These inferior segments fuse in the median line to form a single canal, called the genital canal (Leuckart) or the utero-vaginal; their upper portions, diverging between the ends of the genital cord and the round ligaments, become the uterine cornua. Normally, these horns are little developed in the human species, being absorbed into the fundus of the organ as part of its further development. But if the space included between the insertion of the round ligaments and the end of the genital canal is obliterated, as is the rule in certain animals and the abnormal exception in the human female, the uterine fundus is diminished or suppressed; the organ then develops singly at the expense of the cornua which become very prominent, and open into the vagina by distinct orifices; this is the case in the rabbit, the squirrel, and the hare. If the limit between the vagina and the uterus is increased from the insertion of the round ligaments a little below the summit of the genital canal, the uterine body remains very small, as is the case in the rat and the guinea pig. Finally, the body of the uterus may be produced beyond the summit of the genital canal, as in carnivora, pachyderms, ruminants, solipeds, etc. In the cheiropters the uterine cornua are much prolonged, and in the monkeys they disappear. In the human type this simple disposition of the uterus reaches its highest degree in the normal condition[1] but an entire series of malformations may be derived from embryonic arrangements which reproduce the types which I have indicated in the animal scale by reversive anomaly (Darwin).

Such cases should be referred to their proper place by the aid of comparative anatomy. In most of the marsupials (Didelphys dorsigera) the ducts of Müller do not fuse, but evolve separately, and pro-

duce two uteri and two vaginæ opening by two distinct orifices into the vestibule. At other times the two vaginæ, though separate by their median portions and distinctly two canals, fuse at their upper parts, and receive the two uteri and also at the lower end, which opens into the vestibule (halmaturus).[2] Traces of the internal division of the genital canal into two exist more or less clearly in all animals with the exception of man and monkeys. In many rodents, the hares, for example, there is thus a double uterus and a double vagina; in others, like the mice, the septum is found only at the superior part of the canal uterus.

The preceding considerations are of the greatest interest in appreciating the malformations of the vagina and the uterus, for they complete and explain the facts of human embryology. It is not only in comparative anatomy that phylogeny and ontogeny should be associated, but also in teratology; and thus we are able to account for the arrest of development which the parts may undergo, by understanding the various stages of their growth.

The Müllerian ducts are disposed side by side in the genital cord and fuse except at their lower extremity at the end of the third month. At this time the genital canal shows no trace of a division into its uterine and vaginal portions, and it is lined by the primitive epithelium of the Müllerian ducts. The whole lower portion of the genital canal is still imperforate, and the walls of the future vagina are fastened together, as are also the glans and prepuce and the eyelids and eyeballs at the same period.[3]

At the end of the third month the lumen of the duct at the vestibule begins to enlarge and increase steadily as it advances from that point; the two Wolffian canals burrow under the utero-vaginal conduit, and open into the vestibule behind the urethra. This canal, which is separated by a septum into two halves up to the vestibule, becomes single by the disappearance of the partition which progresses from below upward and is complete about the fifth month. The differentiation of the canal into vagina and uterus begins at the end of the third month by the appearance of the cervix, which is completed one month later.[4]

The internal surface of the uterus remains uneven and folded during the entire fœtal period; the furrows of the arbor vitæ apparently reaching to the fundus because the fundus is not yet developed, but is formed later by the thickening of that portion of the organ which is situated between the insertion of the tubes; these latter structures

are at first provided with a simple opening, but soon acquire a fringed pavilion.

The development of the lower portion of the vagina is not clearly understood. Hofmann [5] supposes that the Wolffian canals take part in this formation, and Tourneux and Legay have lately maintained a similar theory, which seems very contestable.[6] But with the facts of teratology, there appears to me to be no doubt that the region which we may term, with Legay,[7] the vestibular canal and which is usually confounded with the vagina, is independent from an embryogenic point of view; for we often see that a very short vestibular canal may coexist with complete absence of the Müllerian vagina. This region, which is almost wholly effaced in the adult by the deformation and depression caused by coitus and parturition, is very clearly defined in young girls, and extends from the border of the labia majora to about 1 mm. below the hymen. I am inclined to think that it is a vestige of the uro-genital sinus. However that may be, from the standpoint of philosophical anatomy, this short region is wholly distinct from the vagina, and should be considered as a dilated portion of the urethra which receives the Müllerian vagina. It is this vestibular canal which forms by its great elongation the major portion of the vagina in the pseudo-hermaphrodite (hypospadias in the male). It is evident then that it may be provided with a hymen which is ectodermic, I think, and not derived from the Müllerian ducts.

The hymen, which, according to the partisans of the commonly received theory, comes wholly from the ducts of Müller, is formed by an invagination of these canals in the uro-genital sinus. Dohrn [8] places its appearance at the beginning of the nineteenth week. According to Legay and Tourneux, this membrane results from the transformation of the primitive projection from the posterior wall of the uro-genital sinus, which crosses the canal of Müller to end in the sinus, or rather to apply the epithelium of these canals to the part which it is to cover. I have already briefly stated that the membrane does not form an isolated diaphragm (p. 442), but belongs to an entire hymeneal apparatus which is homologous with the urethral mucous membrane which forms the corpus spongiosum of the male urethra.[9] However that may be, the hymen takes its characteristic form and becomes prominent in the vestibular canal only after the vagina has been dilated by the accumulation of pavement epithelial cells which begin to distend it as with a caseous mass toward the end of the fifth month. At this time the vaginal rugæ and columns are prolonged

upon the posterior surface of the hymen, which seems to confirm the opinion that these two membranes are absolutely one. This continuity of the investment of parts which have a different origin is not unusual in embryology and is a secondary fact of development. The constitution of the hymen is essentially different from that of the vagina—for instance, in the absence of smooth muscular fibres in it. O. Schaeffer has shown the primitive form of the two independent lamellæ which unite only after the fifth month. Only the superior layer is a prolongation from the vagina; and certain teratological facts tend to prove that the portion of the canal situated immediately above the hymen, which it covers and binds to the vagina, is really of ectodermic origin and formed the upper portion of the vestibule.[10]

At birth the uterus still preserves an appearance which is very different from its adult form. The cervix constitutes its major part, and the fundus seems to be wholly secondary; the length of the cervix is double that of the body, and its walls are much thicker. The external os is large, the anterior lip exceeding the posterior; and this disposition, like the muzzle of the tapir, is often found in the adult as a vestige of the embryonic condition. If the two walls are separated, there is found on each a ridge directed longitudinally which serves as the axis of the oblique folds which run from above down and out; these ridges, which begin near the vaginal orifice of the cervical canal, reaching to within a half-centimetre of the fundus of the uterus, fit into a furrow on the opposite side formed by the transverse folds of the arbor vitæ; the anterior axis is to the right, the posterior to the left.[11] I insist on this disposition, as it has been employed in the decision of the variety of malformations and arrests of development when there is no real advantage in separating them; the uterus is called fœtal where the arbor vitæ has the aspect which I have described, and infantile when it ceases at a great distance from the fundus or where there is a clear demarcation between the cavity of the cervix and that of the body. These distinctions are interesting from a purely theoretic point of view, but of no practical importance.

During the first years of life the uterus does not appear to participate in the growth of the body; its life remains latent until the moment of puberty. Then, however, the change is rapid in both form and volume. It is the fundus especially which undergoes this increase, and the result is that it becomes far more prominent than the cervix, which becomes only an appendage of half the size and less than half the thickness; at the same time the folds in the uterine

cavity disappear, and the internal os becomes more pronounced. It is of interest to notice that this complete development may not be reached at puberty, but that pregnancy may produce it.[12]

With the object of classifying malformations of these parts L. Fürst has established five divisions in the embryonic period: [13]

First Period—From Fecundation to the Fifth Week.—This is the indifferent period where there is no marked tendency toward either sex; the ducts of Müller and the Wolffian body are not yet atrophied; the ducts of Müller are separated by a septum; there is a cloaca into which empty both intestine and urachus; the genital tubercle and fissure do not show any sexual indications.

Second Period—From the Eighth to the Twelfth Week.—At the end of this time, the septum in the genital canal has wholly disappeared; the fusion of the Müllerian canals is prolonged far upward; the insertion of the round ligament is clearly separated from what will be the tube above and what will be the uterine cornu below; and at the end of the period, the cloaca has divided into anal and uro-genital portions.

Third Period—From the Twelfth to the Twentieth Week.—The uterine horns are fused, the arbor is distinct in the cavity of the organ, while the vagina is still smooth; the cervix is formed; the perineum is enlarged; the vagina is developing, and the uro-genital sinus, which has been stationary, seems now to open into the genital canal, and after this time forms the vestibule of the vagina, where the hymen appears; the genital tubercle is reduced to the proportions of the clitoris, and the edges of the genital fissure form the nymphæ.

Fourth Period—From the Twentieth Week to the End of Fœtal Life.—During this time, the folds in the vaginal mucous membrane are formed, as well as in the cervical canal, and the fundus of the uterus develops more appreciably.

Fifth Period—From Birth to Puberty.—The uterus increases in thickness a little; at the sixth year the uterine mucous membrane, which has been folded up to this time, becomes smooth, and there remains only one vertical ridge.

Etiology—Pathogeny.—For a long time all malformations of an organ were considered only caprices of nature. The first attempts at a rational explanation, based upon arrest of development, were made by E. L. Meissner[14] and W. H. Busch,[15] but it was Kussmaul[16] who developed these ideas, and rendered them classic in a work which caused his predecessors to be forgotten. In France the new classifi-

cation was described first by Le Fort.[17] After him many cases were published.[18] Fürst contributed much to the exact definition of the embryonic epoch which corresponded to each of the anomalies.

What is the initial cause of anomalies in the genital organs? Is it arrest of development, or shall we suppose a higher cause, namely, atavism, reproducing sporadically in one species the forms of some other by the effect of what Darwin terms reversion? I will not do more than indicate this interesting view.

The predisposing causes are very obscure. There is no doubt that heredity plays some part, although it is paradoxical to suppose that total absence of the uterus may be thus explained. Squary mentions the cases of three sisters who had never menstruated, three of whose aunts were sterile.[19]

The immediate cause, the anatomical condition of the malformation, in the great majority of the cases is a simple arrest of development in the morphological evolution or the organic growth of the parts, but it is important to make a clear distinction between the facts of these two categories. In the first the organ may have the adult dimensions, but the type is embryonic; in the second, which may exist alone or combined with the first, an organ of the adult type is affected with aplasia and remains too small in whole or in part.

Finally, there are cases which we can explain only by supposing that there is a pathological process which has produced adhesions during the period of fœtal life. Of this order are certain vaginal bridles, and also the peritoneal bridle, which passes between the posterior wall of the bladder and the anterior wall of the rectum, which is often found in cases of bicornate uterus. But we must employ such comparisons sparingly, for they lead only to the neglect of all other investigation. The pathological influence which has been mentioned has been strongly questioned, and the vaginal adhesion explained by an arrest of development at the time when there is as yet no lumen in the canal; as to the peritoneal bridle, it is natural to admit that it is the effect of the malformation of which I have suggested the cause.

Malformations of the uterus and vagina are frequently solid, there may be complete absence of one of the segments of the canal with incomplete partition of the other. But as these may exist separately, it is of clinical value to describe them in distinct chapters.

MALFORMATIONS OF THE VAGINA.—*Complete Absence or Rudimentary Development.—Pathology and Symptoms.*—Anatomically

there is a radical difference between these two varieties, but clinically this disappears. In the complete form, there is no trace of vaginal tissue between the rectum and the bladder; in the rudimentary, there is a fibrous cord of connective tissue occupying the position of the vagina.

The uterus may be entirely absent or reduced to a rudimentary

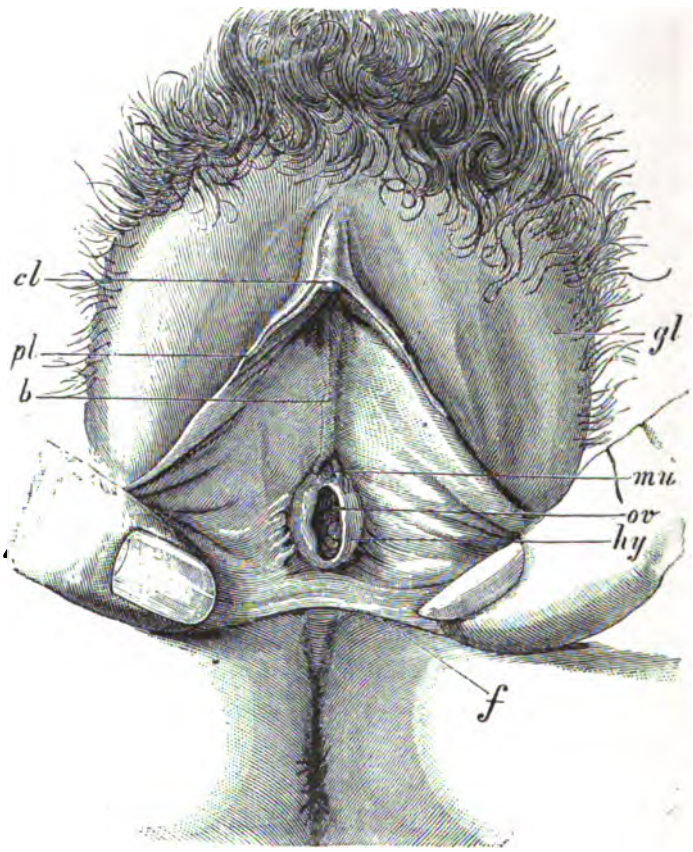

FIG. 152.—ABSENCE OF VAGINA AND UTERUS (OR RUDIMENTARY UTERUS), WITH WELL-DEVELOPED HYMEN. *cl*, Clitoris; *gl*, labium majus; *pl*, labium minus; *b*, frænum masculinum; *mu*, meatus urethræ; *ov*, closed vagina; *hy*, hymen; *f*, fourchette.

nodule; in other cases it is normal and there are ovaries, but no menstrual molimen. Exceptionally there are periodic pains at the time of ovulation. L. Le Fort observed one case where the uterus existed and there were extreme pains at each menstrual period, with vicarious hemorrhages from the conjunctivæ or the skin of the legs which split spontaneously, or hæmoptysis.[20] The vulva and the vagina may both be entirely absent at the same time,[21] but more often the vulva

is well formed and there is a funnel-shaped depression behind the well-developed nymphæ, and the hymen may also be perfectly normal (Fig. 152). The urethra is at times dilated by coitus.

There are two important varieties to be distinguished according as this complete absence or rudimentary development involves the whole length of the canal or only one of its parts. The vagina is formed from the Müllerian ducts, and the process always goes on from above downward.[22] It is therefore difficult to understand why it is the lower portion of the vagina which most frequently exists in these cases of arrested development. It seems to me that it is the normal elongation of the vestibular canal which persists, the anterior portion of the uro-genital sinus; this ectodermic opening, which is insignificant in the normal condition, takes on a new importance, predominating as it did in the embryo before the development of the Müllerian ducts exceeded it. This pouch, which is often found in the absence of the vagina and the uterus, may be 2 or 3 cm. in length and wide enough to admit the finger; but efforts of coitus increase these dimensions very considerably. The vestibular cul-de-sac is closed by a pearly, reticulated membrane with a cicatricial appearance.

The vagina may be absent in its middle portion, and its two ends are then separated by a membrane of variable thickness which is at times perforated; there is then without doubt an arrest of development in the Müllerian portion and a compensatory increase in the vestibular canal which endeavors to reach the upper part and fuse with it. These two segments have been seen to impinge upon each other without union of their canals. To suppose that in such cases one of the ducts of Müller is lacking in its lower part, and the other in its upper part, is to formulate a very improbable theory.[23] My explanation seems more natural.

Rectal touch with the vesical sound, or even with the finger in the bladder, should always be carefully employed in such cases, and the expansion of the urethra produced by attempts at intercourse still more widely dilated by Hegar's bougies if necessary. The fibrous cord which exists in the case of rudimentary development will thus be felt, and will serve as a guide during operation. When the uterus is absent or rudimentary, rectal touch permits the sound to be felt both below and above it. The ovaries should be sought with care by bimanual palpation combined with rectal touch. The examination should always be made under anæsthesia.

Treatment.—The absence of all or a part of the vagina offers dif-

ferent indications according as the uterus is developed; if this organ is normal, the phenomena of hæmatometra occur at puberty and require interference, as I will describe later.

If there is no uterus, and the ovaries are well developed, the painful dysmenorrhea which appears at the time of ovulation may be a sufficient reason for the performance of castration, which has been done several times with success.[24]

Where there is only a deformity which renders the person sexually incompetent, and the woman demands the creation of a vagina simply for the purposes of coitus, are we justified in operating unless there are accidents from retention? The question has been answered in various ways. Schröder, Hegar, and Kaltenbach are inclined to the negative, considering the danger and the risk of injury to the adjacent organs when there is no uterine tumor to serve as a guide. But Le Fort[25] justly remarks that there are circumstances where the operation of complaisance might become one of necessity. It was first performed by Amussat.

If we decide to make an artificial vagina, we proceed with the greatest precaution to the liberation of the septum at the bottom of the vulvar depression, using the fingers chiefly in the division of the soft parts, and proceeding step by step by combined tearing and dissection, the finger of the operator or an assistant being kept in the rectum and a sound in the bladder.

When the depth of 6 to 8 cm. has been reached, the second step of the operation should be performed, which is the investment of the funnel so created with integument to prevent cicatricial contraction. For this purpose the skin and mucous membrane of the adjacent parts may be employed; and the first incision must therefore be carefully made in the form of a transverse cut with two lateral branches, like letter H. After the sutures have been applied, the artificial canal must be packed with iodoform gauze, and this treatment continued until cicatrization is complete; then a Gariel pessary may be substituted.

In spite of every care in the operation, of which Picqué[26] has published an excellent example, the primary result is maintained with difficulty, for the angle which forms the bottom of the cavity is very hard to cover with the graft, and, even when the graft has adhered well, there is an invincible tendency to draw the flap outward and gradually fill up the canal. Fortunately the surgeon's efforts find an auxiliary in the daily practice of coitus, which in certain cases has given results which surpassed hope (Richet).

Polaillon,[27] who was able to reach to the uterus in one case, operated in two sessions after an interval of three weeks; and this method of several operations was advised by Amussat, who was the first to create an artificial vagina.

Le Fort[28] has obtained remarkable success with electrolysis in a case where there was a uterus and the menses were replaced by vicarious hemorrhages. He made a cylinder of boxwood, furnished with a copper end, which was connected to a six-element battery of Morin sulphate-of-copper cells, and a metallic plate placed on the abdomen with some wet compresses interposed, made the connection; this apparatus was used during the night. After a short time the cylinder had created a canal of about 8 cm. depth, which Le Fort enlarged progressively, at first with a forceps like a glove-stretcher one of whose branches was tipped with copper, and afterward with a wooden dilator. The result was satisfactory, but we do not know whether it was permanent.

Unilateral Vagina.—It is probable that in this case but one of Müller's ducts serves to form the vagina, although this anomaly of development may not be apparent; it is certainly the case in the one-horned uterus. It might be suspected from the narrowness of the canal. In cases of partially double vagina, there is an incomplete development of one of the ducts, and the vagina is partly unilateral, but it is better to class these cases with the following.

Double Vagina.—When there is a septum which divides the entire vagina, the uterus is also double or divided. The hymen may be furnished with two openings, as mentioned above (p. 446), simulating a double hymen; or it may have the annular form, separated from the septum by a decided interval. The septum is generally placed in the middle in such a way that one of the canals is situated a little anterior to the other; when coitus is practised, it is by the larger of the two conduits.

An important variety of this condition is seen in what may be termed lateral vaginal atresia, constituted by the rudimentary development of one of the halves, whose lower end remains closed, but whose superior extremity receives one cervix of the double uterus; this condition is almost always found on the right side (20 times in 28, Puech). Thus, there is a blind pouch by the side of the principal vagina, which may remain unnoticed until it becomes filled with blood at puberty, or with pus from an infection through a weak part of the septum; thus occur peculiar cases, which for a long

time escape diagnosis, which are called lateral hæmatocolpos or pyocolpos.[29]

The first, due to the retention of the menstrual blood, often coincides with lateral hæmatometra, but the collection of pus may be limited to the vaginal pouch without distention of the corresponding segment of the uterus, for it quickly makes an exit for itself by perforating the septum, as I have seen in one case. There may also be pyometritis, which is a grave condition; and the evacuation of the pus does not remove the danger, for the perforation may take place high up on the septum, even within the uterus, and the purulent material collects again (Breisky).

When there is hæmatometra, the collection may be mistaken for an intra-peritoneal pelvic hæmatocele. If the vaginal tumor alone is present, it may be considered as a cyst of the vagina, and Freund[30] has even asserted that certain cysts were of this origin, which seems to me to confound two lesions which are really distinct.

The partition of the vagina may be only partial, and it is then the superior portion of the septum which is lacking, for the Müllerian ducts coalesce from above downward.[31] But when the uterus is double, the upper portion of the vagina may be found to contain the septum, as if the division of the uterus were carried down into the vagina, while the fusion is complete below.

Usually the septum is thick and fleshy, resembling the recto-vaginal partition, but it may be very thin or even perforated in places; or the only traces which exist may be merely a few bridles stretching from side to side. These lesions have been considered alternately as vestiges from the fusion of the canals of Müller and as adhesions formed during fœtal life.

The partition of the vagina may not be incompatible with normal labor. Dunning[32] reports a case where there were two vaginæ separated by a septum which began just above the vulva, and extended to the interval between the two small cervices, and the sound demonstrated that the division continued into the uterus. Pregnancy occurred on the right side, where the uterine cavity was larger, the cervices swelled equally, and the septum between the two uteri disappeared, probably by absorption. During labor, the vaginal septum was torn from top to bottom, and only its lower portion persisted; the labor was accomplished without difficulty. The absorption of the septum during pregnancy is not unusual; the abnormal tissues seem to suffer great disturbances in their nutrition on account of the

changes which take place in the puerperal state. The danger of uterine rupture is not great on account of the ease with which the septum is torn and the congenital bridles stretch. But it may happen that incomplete septa form an obstacle to the passage of the fœtal head, and in this case they should be divided during parturition; there is no danger of hemorrhage.

For the symptoms and treatment of hæmatometra complicating lateral hæmatocolpos, I refer to the following chapter.

Simple pyocolpos without dilatation of the uterus requires free incision, without which the suppuration cannot be controlled. I think that the indication is to make an excision of the whole wall of the purulent pouch at the same time; this may be performed with the scissors and the hemorrhage controlled by the thermo-cautery or the catgut suture, followed by antiseptic injections and tamponing with iodoform gauze. A septum or a bridle resulting from an incomplete septum which were an obstacle to coitus might be excised in the same manner.

Congenital Atresia and Stenosis—Transverse Bridles.—The history of atresia of the vagina, from an anatomical point of view, is confounded with that of imperforate hymen and of absence or imperfect development of the vagina, as already described. For the treatment of hæmatometra, I refer to the following chapter.

Stenosis or contraction of the congenital form, when it presents the appearance of partial adhesions or of transverse bridles, is undoubtedly due to the persistence of the fusion of the vaginal walls, as Geigel has demonstrated on a fœtus of four months. But it may also be due to arrested development of Müller's ducts at a definite point of their course; the contraction may be so complete that the end of the sound will hardly pass, and it may occupy only the superior third of the canal,[33] where contractions of this kind are usually found.

In the case of one-horned uteri the vagina may be very narrow, due to the fact that the canal is formed from only one of the ducts of Müller, the other having aborted throughout its entire length.

Contractions in the form of transverse bridles may take the form of crescents or of incomplete diaphragms; these are probably the cases which are described as supplementary hymens.[34] These atresiæ cause the retention of the menstrual blood within the uterus when any obstacle temporarily obstructs their lumen; then an overflow occurs, followed by new accumulation of fluid; and serious accidents may occur in this way.

The obstacle to copulation and to parturition may require operative interference. But here also the tissues swell so much under the influence of pregnancy that they stretch to an unexpected degree, which may render the proposed operation unnecessary.[35] This elasticity has certain limits, and there should be no hesitation in cutting the bridle with the scissors if it offered a manifest obstacle at the moment of parturition; too long delay has permitted the uterus to rupture.[36]

The anomaly which consists in the presence of transverse bands may be compared with the same condition which is normal in the vaginæ of certain animals. The vagina of the cetaceæ has been found to contain as many as eight successive folds;[37] in the chimpanzee the vaginal folds form crescents of great extent;[38] and in the sheep[39] these rings or diaphragms extend up to the cervix.

MALFORMATIONS OF THE UTERUS.—I. *Absence and Rudimentary Development of the Uterus.*—These two malformations do not require separate description, for the differences which distinguish them have no importance clinically, however interesting from the standpoint of teratology; in either case there is no uterus, whether we can find no trace of it or only an insignificant vestige.

Complete absence (defectus uteri) is extremely uncommon, and many cases of the anomaly which have been published are probably due to an error of interpretation; there are numerous autopsies where the rudimentary horns of the uterus were taken for the non-existent tubes. The exact insertion of the round ligaments is a valuable point in the decision of the question. In complete absence of the uterus, the rectum and the bladder are in apposition, and the round ligaments are lost in the cellular tissue which separates these two viscera; the ovaries may also be wanting. A similar anomaly is met, with other grave deformities of the viscera, in non-viable infants.

The rudimentary uterus (uterus rudimentarius) is constituted by a mass of small size and variable form which occupies the place where the uterus should be. This vestige of the organ may be either a slight thickening of the posterior wall of the bladder (Veit), or, if reinforced with a few fibro-muscular bands, part of the broad ligament (Langenbeck), or a small band stretched between the tubes (Nega). When it is joined to the cervix in the form of a T, it is called uterus bipartitus, being reduced to its two cornua and reproducing the type of some of the lower animals; these cornua may be hollow and carpeted with mucous membrane. The ovaries may be altogether wanting, or, if

present, may be atrophied, flattened, and shrunken; but they may also be perfectly developed (Figs. 153, 154).

Ovulation occurs in such cases, but causes no molimen as a general rule, and there is no menstruation. As to the rest of the genital organs, the vagina is most often wanting in whole or in part, through-

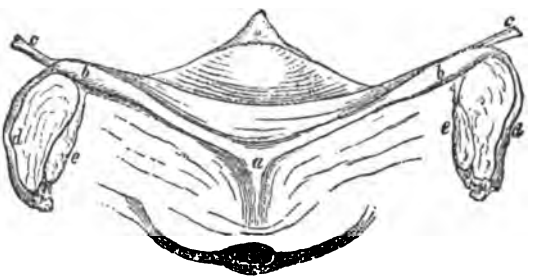

FIG. 153.—RUDIMENTARY UTERUS (VEIT). *a*, Imperforate uterus; *b b*, rudimentary cornua; *c c*, round ligaments; *d d*, tubes; *e e*, ovaries.

out its entire Müllerian portion, its place being taken below by a short vestibule; the external parts are well formed.

In rare cases, however, the vagina is completely developed, of which I have seen one example,[40] and Mundé[41] and Leopold have also observed one. Another case which is quite certain, where castra-

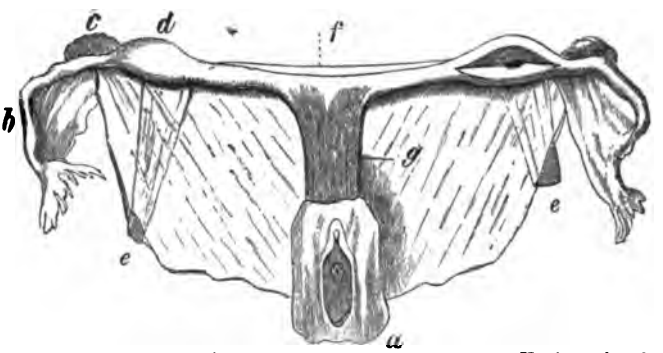

FIG. 154.—RUDIMENTARY UTERUS, VARIETY BIPARTITUS (ROKITANSKY). *a*, Vagina, closed; *g*, cervix; *d*, rudimentary cornu; *b*, Fallopian tube; *c*, ovary; *e*, round ligament.

tion was performed for the pains caused by ovulation, belongs to Max Strauch.[42]

Women who present these anomalies have nothing externally which would lead one to suspect it; the form of the body, the voice, and the psychical characteristics are those of a well-made person, and the development of the breasts is normal. Usually they have relations with the other sex, and the result is to deepen the cul-de-sac of

the vestibule till it becomes a large canal; at other times it is the urethra which serves the purposes of copulation.

The diagnosis between a normal and an atrophied uterus is easily made by the aid of bimanual palpation and rectal touch, the latter combined with the sound or the finger in the bladder. At the same time the abdominal parietes should be strongly depressed above the pubes by an assistant. To determine upon the living patient whether the uterus is rudimentary or wholly absent is generally impossible.

Breisky has established a particular class for cases of absence or atrophy of the cervix, which often coexists with absence of the upper portion of the vagina. The uterus is atrophied, but differs from the rudimentary organ by the presence of a cavity where menstruation occurs, constituting hæmatometra. The cervix is wholly lacking or

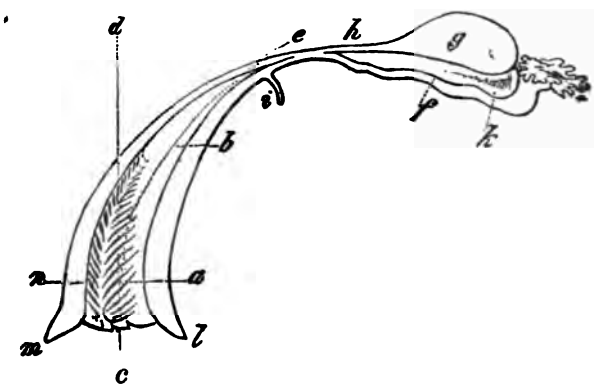

FIG. 155.—DIAGRAM OF AN INFANTILE UTERUS WITH ONLY THE LEFT CORNU (P. MUELLER). *a*, Cervix; *b*, fundus; *cd*, longitudinal axis of the body of the organ; *f*, tube; *g*, ovary; *h*, ovarian ligament; *i*, round ligament; *k*, parovarium.

represented by a small fold. If there is no effusion of blood into the uterine cavity, the symptoms do not differ from those of a rudimentary uterus; in the contrary case there is hæmatometra.

II. *Unicorn Uterus.*—The uterus is developed from only one of the Müllerian ducts, the other being atrophied; starting from the cervix, the organ is elongated and strongly curved toward the tube with which it is directly continuous, and of which it is simply the inferior expansion; its summit sustains the ovary. There is actually only a small part of the fundus of the organ, and its cavity is small relatively to that of the cervix; the vagina is very narrow (Fig. 156). On the opposite side there may be no vestige of the other Müllerian canal, and then the uterus is absolutely unicorn.

An important variety is constituted by the presence of a rudimen-

tary body. This may be formed of a band of compact muscular tissue, or it may be hollow with a small cavity which communicates with the larger cornu and forms a diverticulum from it. The rudimentary

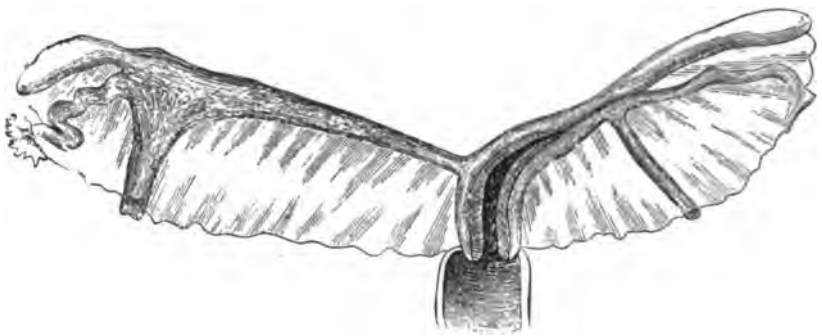

FIG. 156.—UNICORN UTERUS (SCHRÖDER). The left cornu is developed normally and in communication with the uterine cavity; the right cornu presents only an elongated band whose junction with the tube is indicated by the insertion of the hypertrophied round ligament.

cornu is inserted at the level of the internal os (for in such cases the fundus does not exist), and is very long, as if drawn out, and subject to many variations of form.

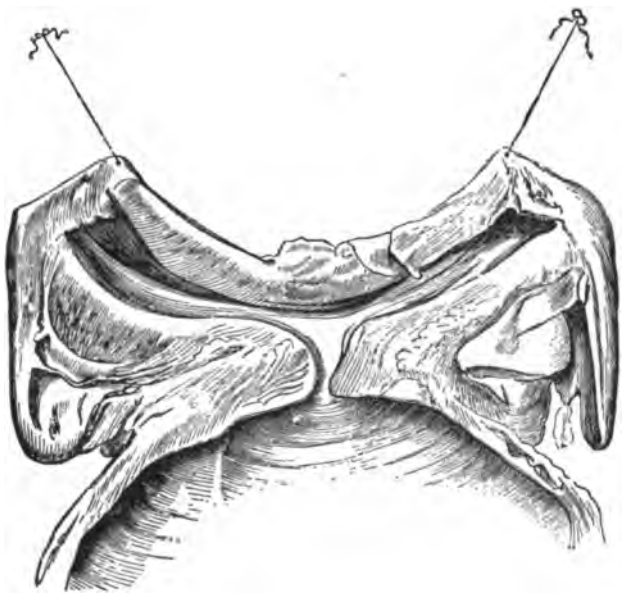

FIG. 157.—DOUBLE BICORN UTERUS (BARNES).

The unicorn uterus is an organ which is mutilated in its origin, but, when it arrives at the adult state, it functionates as a normal uterus; menstruation is regular, and pregnancy is accomplished with-

out danger in the larger cornu. It is otherwise if the ovule is arrested in the rudimentary cornu; then its walls are incapable of furnishing the necessary material to form the cavity required for the growing contents, and it ruptures from the third to the sixth month. Pregnancy of this kind is classed with ectopic pregnancies and studied in the same chapter with extra-uterine pregnancy, with which it has many points in common.

The diagnosis is seldom made; but the malformation may be suspected when the vagina is very narrow, the cervix large and short, and the uterus, on bimanual palpation, of an elongated and curved form.

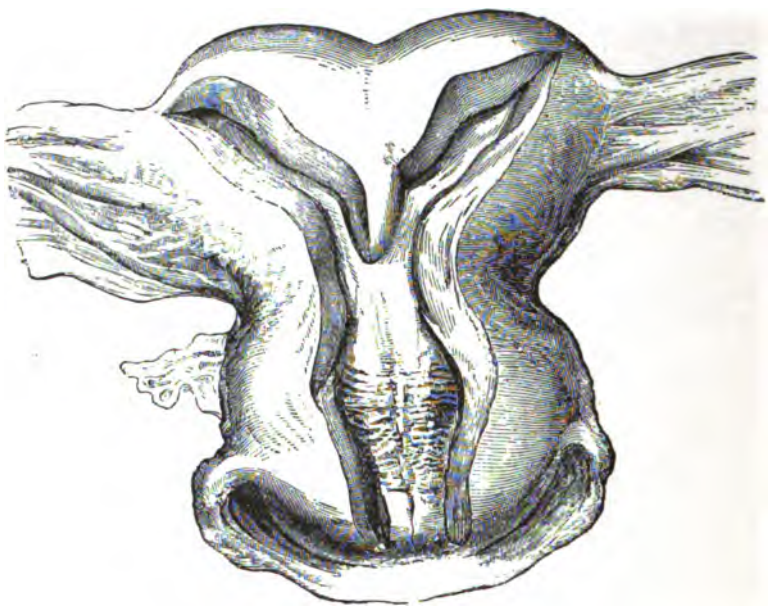

FIG. 158.—BICORN UNICERVICAL UTERUS (BARNES).

Pregnancy in the rudimentary horn is almost always taken for tubal because of the pedicle which separates the tumor from the larger tube, which simulates the body of a well-formed uterus.

III. *Double Uterus.*—The uterus is really double when the ducts of Müller do not fuse or are only partially joined, and undergo each a complete development. There are many kinds of this anomaly:

1. *The bicorn uterus* (uterus bicornis), where the two parts of the organ are separate from each other. If the division reaches the cervix, which is at the same time furnished with a septum, we have a double bicorn uterus (uterus bicornis duplex or septus). When the

coalescence is more pronounced, the cervix presents no trace of a septum, but is very large; this is the unicervical bicorn uterus (uterus bicornis unicollis). Finally, when the two uterine segments are almost complete, and this bifid condition is manifested only by a depression at the fundus, we have the arched bicorn uterus (uterus arcuatus), which is a transition form and the last stage before the normal organ (Figs. 157, 158, 159).

Usually the left cornu is directed forward in such a way that the uterus is twisted round its vertical axis. Frequently there is a bridle

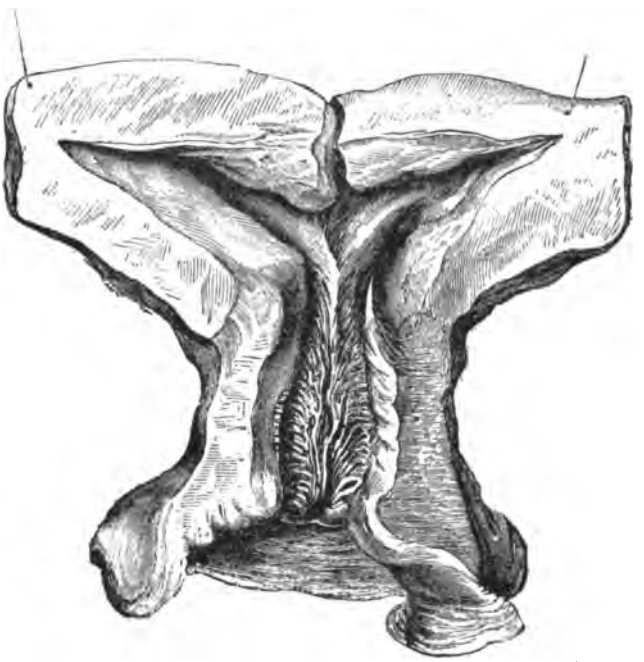

FIG. 159.—ARCUATE BICORN UTERUS (BARNES).

which goes to the anterior face of the rectum from the posterior aspect of the bladder above the notch in the fundus of the uterus; this is the result of a malformation; its importance is very great in pregnancy, for it may be the cause of dystocia.

The two portions of the uterus are seldom equal, and there are many transitions between the unicorn and the bicorn varieties; the less developed side is apt to be the seat of a hæmatometra. The external organs and the breasts present no peculiarities, but the vagina is often double, and on one side there may be hæmatocolpos.

If both sides are developed equally, menstruation may occur in

each segment, and pregnancy then interrupts the menstrual flow only on one side.[43]

Pregnancy follows its normal course and the fœtus reaches full term, the hypertrophy of the non-gravid side keeping pace with that of the other, and membranes have been expelled from it; during labor both cornua contract.[44]

Gontermann has reported a case where the pregnancy seemed to occur alternately in either side.[45] Twin pregnancies have been observed where there was a fœtus in each cornu; at other times both children will be developed in the same segment of the uterus. With the arcuate form of the organ, transverse positions are frequent. This malformation of the uterus, like all the others, may be a cause of vicious attachment of the placenta; rupture of the organ has also been observed.

The vesico-rectal bridle may present an obstacle to the passage of the fœtal head. At times it is sufficient to alter the obliquity of the gravid portion and allow the patient to lie on the opposite side; but it may be necessary to perform podalic version and extract the child. Bands in the vagina should be divided, and, if there is lateral hæmatometra, it should be evacuated. Finally, it is well to notice how often an anomaly of the uterus passes unrecognized through pregnancy and parturition, to be discovered much later; the septum is mistaken by the touch for the wall of the vagina or uterus.

2. *Bilocular Uterus* (*Uterus Bilocularis, Septus, Bipartitus*).—The characteristic feature of this variety consists in the normal external configuration of the organ, while its cavity is separated into two by a median partition. This division may be complete or it may cease inferiorly, forming the uterus subseptus; or the septum may be pierced with openings which leave only a number of bands across the cavity. The vagina may be either single or divided, and in the latter case each of its cavities corresponds to one of the segments of the cervix (Fig. 161). Corazza[46] has reported an exceptional case where the vagina was divided, and the uterus was not.

What has been said of the bicorn uterus as regards menstruation, pregnancy, and atresia of the segments, with hæmatometra, applies also to the bilocular variety of malformation.

3. *Didelphic Uterus* (*Uterus Duplex, Separatus, Diductus*).—In these cases there are actually two uteri, separated as far as the cervix and including it, and not two bodies more or less divergent as in the case of the bicorn variety. Here each segment presents the

appearance of a complete uterus, and may be said to be two unicorn uteri equally developed and apposed without fusion. It was thought that this malformation occurred only in non-viable embryos with deformities of a serious nature affecting other organs, and it has been seen with ectropion of the bladder, atresia of the anus, and persistence of the cloaca. Cases observed in adults are of comparatively recent date; but it is probable that many of the older cases of bicorn uterus ought to be revised and placed in this class.[47] The most conclusive case of the didelphic uterus in the adult is that of Olivier,[48] where at the autopsy of a woman of forty-two years, the mother of six chil-

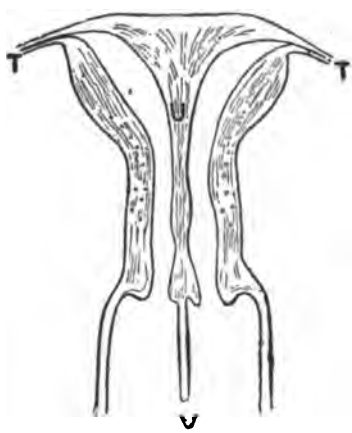

FIG. 160.—BILOCULAR UTERUS AND VAGINAL SEPTUM; VERTICAL SECTION (KUSSMAUL). *U*, Partition which divides the uterus into two halves; *T*, tubes; *V*, vagina divided by the uterine septum prolonged.

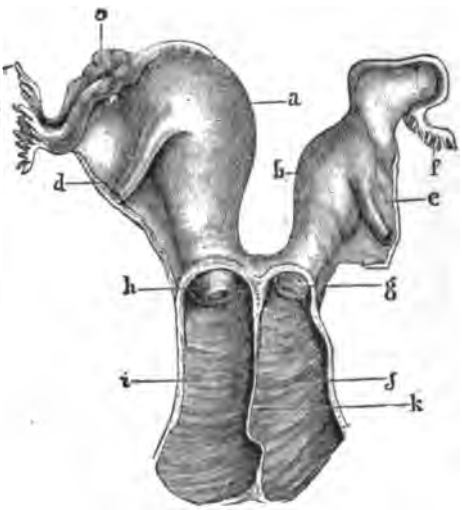

FIG. 161.—DIDELPHIC UTERUS AND DIVIDED VAGINA (OLIVIER). *a*, Right segment; *b*, left segment; *c d*, right ovary and round ligament; *fe*, left ovary and round ligament; *g j*, left cervix and vagina; *k*, vaginal septum; *h i*, right cervix and vagina.

dren, this malformation was discovered. Heitzmann[49] reported a case of a young woman of twenty-three years where the vagina was double, with a septum which divided the cervix; and a sound in the two uterine cavities proved that they diverged from their cervical union and became two distinct and movable organs.

The recto-vesical ligament which so often passes above the bicorn uterus has not been described with the didelphic form.

In clinical examinations it is always difficult to decide whether the case is one of complete bicorn or of didelphic uterus; it can be certainly decided only on anatomical examination. The clinical histories of the two forms seem to be the same in each case, as far as we

can judge by the few specimens of the didelphic form which we possess.

Atresia of one of the segments may produce lateral hæmatometra;[50] pregnancy may occur in each side simultaneously.[51]

IV. *Fœtal or Infantile Uterus.*—This anomaly is produced when the uterus is completely developed in its general formation, but remains stationary and preserves the proportions and nearly the dimensions which it had at birth. A subtle distinction has been drawn between the fœtal type which represents the last stage of the embryonic evolution, with the mucous folds extending even into the fundus of the organ, and the infantile type where the organ resembles the uterus of the new-born child with the folds only in the cervix. It is but a refinement of anatomy which deserves mention merely; from all other points of view, the two varieties are identical. The characteristic of both is the unequal development of the cervix and the fundus, reproducing the fœtal type. The cervix is twice or thrice the length of the body, and, while its walls are relatively thick, those of the fundus are thin or even membranous. The whole length of the cavity does not exceed 4 cm.; the cervical orifice is small, and the cervix is conical or tapiroid (in the shape of the tapir's muzzle). The vagina is usually short and narrow; the external organs may be well developed and the breasts small. There is complete amenorrhœa.

FIG. 162.—INFANTILE UTERUS (SCHROEDER).

If the uterus is atrophied, the condition may be easily recognized on bimanual palpation with the aid of rectal touch. To distinguish the fœtal from the pubescent uterus, which presents the same reduced dimensions and occasionally the same amenorrhœa, we may be guided theoretically by the size of the cervix. In the uterus of the fœtal type, the cervix is quite firm, especially in its supra-vaginal portion; in the pubescent uterus, on the contrary, the cervix is thin and relaxed. As a matter of fact, however, these distinctions are clinically without practical value, and are also a little illusory.

Minor Uterine Anomalies.—It is convenient to describe under this head a number of slight malformations which do not belong in the classes already treated.[52]

Congenital Obliquity and Latero-Position of the Uterus.—This condition is due to asymmetry of the organ where one part predominates and causes a distortion of the other, inclining it toward the well-developed side; the result is a relative shortening of the broad liga-

ment. In the cases where this is not very pronounced, a simple latero-version is found, which may be compared to congenital ante-version. When well marked, this anomaly might be confounded with the unicorn uterus if we were not apprised of the possible error.

Duplicity of the External Os (*Uterus Biforis*).—A double os may be found where the uterus itself is single.[53] This anomaly has been the cause of accidents during delivery, but usually the bridle is either torn or pushed aside; serious bleeding has followed its laceration. If the physician is not aware of this deformity, he may easily be perplexed by it; if he recognize it, he will attempt to keep the band on one side and disengage the fœtal part which presents, or, if this fails, he will cut it between two ligatures.[54]

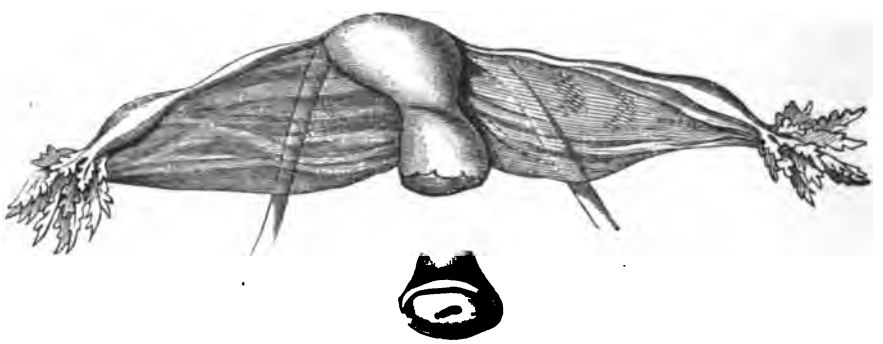

FIG. 168.—CONGENITAL OBLIQUITY OF THE UTERUS; INCOMPLETE DEVELOPMENT OF THE RIGHT SIDE (TIEDEMANN).

Incomplete Transverse Division of the Cervix.—P. Müller[55] described for the first time the presence of a transverse fold in the cervix which projected into its cavity. After dilating the part he found a second cervix fitted into the first one. Breisky has also seen this anomaly, but his case is not published. In both these cases, observed in the non-gravid uterus, the band appeared to be the cause of hemorrhages, acting like a fibroma or a polyp, and its excision caused the cessation of the symptoms.

Such bands may be an obstacle to delivery. Bidder[56] has published a very instructive case of this kind. Recently Budin[57] has again drawn attention to the subject by reporting two personal cases where the septum was not a cause of dystocia, and two cases of Mme. Henry's where the bands were situated at the internal os in one and about 2 cm. above it in the other, in the lower segment of the uterine

cavity. Two similar cases are reported by E. Blanc.[58] These bands may disappear with the labor or persist after it.

This anomaly has been compared with the transverse bands which exist normally in the genital canals of certain animals, as I have mentioned in the case of vaginal bridles (p. 475).

BIBLIOGRAPHY AND NOTES.

1. In the human fœtus the uterus is bicorn until the third month (Meckel, J. Müller); but even at this time we can see a space where the developing organ will absorb and efface the horns. At the end of the fourth month the distance between the insertions of the round ligaments is 4 mm., although the fundus itself does not measure more than 2 mm. Tourneux and Legay: Mém. sur le Dévelop. de l'Utér., etc. Jour. Anat. et Phys. Norm., etc., 1884.

2. The obstacle to the fusion of the ducts in the marsupials results from a special disposition of the ureters which pass between the Müllerian ducts, instead of embracing the genital cord, and thus prevent their fusion.

3. Geigel: Ueber Variabilität in der Entwickel. Geschlechtsorg., etc., 1883.

4. Dohrn: Zur Kenntniss Müller'schen Gänge, etc. Sitzungsber. Ges. Naturwissenschaft zu Marburg, 1865. The development of the cervix begins in the fifteenth or sixteenth week, a rounded prominence starting forward to form the anterior lip and from this another progressing backward for the posterior. Tourneux and Legay (loc. cit. [1]) claim, on the contrary, that the external os is not formed by the thickening of the internal wall of the genital canal, but by a budding of the stratified pavement epithelium of the canal which carves out the portio vaginalis by a kind of sculpture.

5. Hofmann: Cong. of Germ. Nat. and Phys. Centr. f. Gyn., 1878, No. 21.

6. Tourneux and Legay: Loc. cit. (1).

7. The signification of the words uro-genital canal has undergone certain modifications at the hands of various authors. J. Müller (Bildungsgeschichte der Genit., Düsseldorf, 1830) thus describes the anterior portion of the cloaca which is detached from the tubular intestine behind and receives by its upper extremity, and very near each other, the ureters, the Wolffian and the Müllerian ducts. Valentin (Handbuch der Entwickel.-Gesch. der Mensch., Berlin, 1835) proposes to replace the word uro-genital sinus by uro-genital canal, which is certainly more correct. Kölliker (Traité d'Embry., French trans., 1882) and his pupils, apply the term to the inferior portion of the canal which is common to the urethra and the utero-vaginal canal in the female. C. Legay (Dévelop. de l'Utér., etc.; Lille Thesis, 1884) advances the name of vestibular canal.

8. Dohrn: Loc. cit. (4).

9. The opinion which represents the hymen as the analogue of the veru montanum approaches my conception, for the veru montanum is the non-erectile portion of the matrix tissue, a dependence of the urethral mucous membrane, at the expense of which the organ of the corpus spongiosum is developed. The homology of the hymen and the veru montanum has been supported by H. Meckel: Zur Morpholog. der Harn- und Geschlechtswerkzeuge der Wirbelth., Halle, 1848; and also by Leuckart: Wagner's Physiologie, vol. iv., 1853.

10. A circular hymen has been found situated 1 mm. below a double vagina and wholly separate from the vertical septum; in many cases the absence of the lower opening of the vagina is mistaken for atresia of the hymen even when there is an intact hymen apposed to the obstructing membrane, which evidently corresponds to the imperforate terminal portion of the Müllerian canals. The hymen is

then situated in the vestibular canal, near its upper limit, but this is not what forms it.

11. Guyon: Des Cavit. de l'Utérus à l'État de Vacuité. Paris Thesis, 1858.

12. P. Müller: Enwickel. des Uter. Deutsch. Chir., Lief. 55, 1885.

13. L. Fürst: Monatschr., xxx., 108–110.

14. F. L. Meissner: Lehrbuch der Frauenk., 1842.

15. W. H. Busch: Das Geschlechtsleben des Weibes, 1841, Bd. iii.

16. A. Kussmaul: Von dem Mangel, der Verkümmerung und Verdoppelung der Gebärmutter, etc., Würzburg, 1859.

17. L. Le Fort: Des Vices de Conformat. de l'Utér., etc. Paris Thesis, 1863.

18. Consult especially P. Müller: Deutsche Chirurg., Lief. 55, 1885. L. C. dos Santos: Missbild. d. Uterus. Zeit. f. Geb. und Gyn., 1887, Bd. xiv., Heft 1.

19. Squary: Obstet. Trans., London, vol. xiv., p. 212. Hauff and Phillips in Schröder's Mal. des Org. Génit. de la Fem., French ed., p. 37.

20. Le Fort: Man. Méd. Op. Malgaigne, 9th edit., 1889, p. 702.

21. Polaillon: Bull. Soc. Chir., March 23d, 1881.

22. R. Geigel: Loc. cit. (3). Tourneux and Legay: Loc. cit. (1).

23. Schröder: Mal. des Org. Gén. de la Fem., French ed., 1886, p. 497.

24. Dos Santos (loc. cit. [18]) mentions operations by Taufer, Langenbeck, Peaslee, Savage, and Kleinwächter. Düvelius (Obst. and Gyn. Soc. of Berlin, in Centr. f. Gyn., 1889, No. 9) reports a case where the ovaries were removed by Martin and contained yellow bodies and scars.

25. Le Fort: Man. Méd. Oper. Malg., 9th edit., 1889, vol. ii., p. 698. Two other cases by Max Strauch: Zur Castrat. wegen function. Ovar. bei rudim. Entwickel. der Müller'schen Gänge. Zeit. f. Geb. und Gyn., Bd. xv., Heft 1.

26. L. Picqué: Absence Congenit. du Vagin, etc. Annal. de Gyn., February, 1890, p. 124.

27. Polaillon: Absence Complete du Vagin, etc. Bull. Soc. Chir., March 23d, 1887, p. 204.

28. Le Fort: Loc. cit. (25), p. 702.

29. The first cases were described by Holst: Beiträge zur Geb. und Gyn., Hft. 1, 63, Tübingen, 1865. Veit: Krankh. der weibl. Gesch., 2d edit., Erlangen, 1867. Simon: Monatschr. f. Geb., vol. xxiv., p. 292. Breisky has collected 47 cases.

30. Freund: Zeit. f. Geb. und Gyn., Bd. i., p. 242.

31. Hoppenheimer (New York Med. Weekly, February, 1889, vol. i., No. 2, p. 89) reports a case of double vagina where one of the canals was reduced to a simple cul-de-sac at the lower portion of the hymen and 1½ cm. behind it.

32. Dunning: Journ. Amer. Med. Assoc., December 1st, 1888.

33. Kyri: Obstet. and Gyn. Soc. of Vienna, May 15th, 1888, in Centr. f. Gyn., 1889, No. 7. In this case there was first abortion, then hæmatometra.

34. Meissner: Frauenk., vol. i., p. 353.

35. Sänger: Obstet. and Gyn. Soc. of Leipsic, January 21st, 1889, in Centr. f. Gyn., 1889, No. 25.

36. E. Kennedy: Dublin Journ., vol. xvi., p. 88.

37. H. Beauregard and Boulard: Jour. Anat. et Physiol., 1882.

38. G. V. Hoffmann: Zeit. f. Geb. und Gyn., 1878, Bd. ii., p. 4.

39. P. Müller: Zeit. f. Geb. und Gyn., 1878, Bd. iii., p. 164.

40. The case was one of a lymphatic young woman who was perfectly formed otherwise, with a normal vagina terminating in a cul-de-sac; no trace of uterus or ovaries on bimanual palpation; no molimen; the patient had no pain, but consulted me solely for her amenorrhea.

41. Mundé: Zur Kasuistik des totalen Mangels der Gebärmutter, etc., in Cent. f. Gyn., 1887, No. 42. Of the four cases which Mundé compares with his, three are

essentially different, relating to hypospadias in the male with pseudo-vaginæ (cases of Ricco, Steglenher, Giraud, Chambers). The single case of Leopold seems to be one of a woman with no uterus but a normal vagina; the ovaries, which Leopold took for testicles, were at the entrance of the vagina. In Mundé's case there was double inguinal hernia, and after reduction, two ovoid bodies were found in the labia majora which Thomas supposed were ovaries, and Mundé, without proof, considered testicles, which made the case one of hermaphrodism. Nothing in the external conformation resembled hypospadias, as should have been the case if the subject were a male and if the bodies in the labia majora were testicles and not prolapsed ovaries.

42. Strauch: Zur Castration wegen funct. Ovarien, etc. Zeitschr. f. Geb. und Gyn., Bd. xv., Heft 1, p. 138.

43. Henderson: Glasgow Med. Journ., April, 1883.

44. On the diagnosis of anomalies of the uterus during pregnancy, see Litschkus: Beitrag zur Frage über die Anomalien, etc. Zeitschr. f. Geb. und Gyn., Bd. xvi., Heft 2.

45. Gontermann: Geschichte eines Uterus bicorn. Berl. med. Woch., 1879, 41.

46. Corazza: Schmidt's Jahrbuch, Bd. cxlviii., p. 148.

47. The exact classification still contains uncertainties; thus Heppner's case (Schmidt's Jahrbuch, Bd. cli.) considered by Schröder as a didelphic uterus, is formally rejected by Breisky (loc. cit., p. 263) on the ground that it is a rudimentary bipartite form.

48. A. Olivier (Compt. Rend. Soc. Biologie, in Gaz. Méd. de Paris, 1872) compares this case to another observed by Bonnet, in a woman of 25 years, cited by Le Fort. Fredenberg (Zeit. f. Geb. und Gyn., Bd. v., p. 384) reports of a didelphic uterus where the right side was closed; Benicke (Zeit. f. Geb. und Gyn., Bd. 1, p. 366), case of labor where the fœtus was placed in the left segment of a didelphic uterus.

49. Heitzmann: Spiegelbilder der gesund. und krank. Vaginalport., 1 Abth., 1883.

50. Staude: Zeit. f. Geb. und Frauenkrankh., Bd. i., 1876.

51. Satchana: Moscow Med. Gazette, 1878, No. 25; analysis in Centr. f. Gyn., 1879, No. 6.

52. The pubescent uterus has been described under the head of congenital atrophy of the cervix (Book vii., pp. 577, 578). Congenital hypertrophy is treated with precocious menstruation (Book viii., pp. 584 and 585).

53. This is the normal condition in the ant-eater.

54. Mekos: Centr. f. Gyn., 1889, No. 13.

55. P. Müller: Zeit. f. Gyn., Bd. iii., p. 159.

56. E. Bidder: Aus der Gebäranstalt des k. Erziehungshaus zu St. Petersburg. Med. Bericht f. die Jahre 1877–1880.

57. Budin: Du Cloisonnement Transversal, etc. Prog. Méd., April, 1889, No. 14 and No. 16.

58. E. Blanc: Du Cloisonnement Transversal, etc. Arch. de Tocol., May, 1889, p. 359.

CHAPTER XXVI.

RETENTION ACCIDENTS FROM GENITAL ATRESIA.

HÆMATOMETRA: HÆMATOCOLPOS: HYDROMETRA: PYOMETRA: PYOCOLPOS: HÆMATO-SALPINX.

Etiology and Symptoms.—I have described in what conditions the genital canal may be closed by atresia situated at different parts of its course from the hymen to the distant portions of a rudimentary cornu. This occlusion may completely obstruct the canal, entirely closing one of the portions which are derived from its division, or may simply shut off a diverticulum which has arisen from defect in the conformation of its parts. However that may be, at the time of puberty, if the ovaries and the mucous membrane of the tubes permit the appearance of the menstrual phenomena, the blood which is voided from the tubes into the uterus may find no way of escape; it therefore accumulates in the closed spaces, which retain it, and distends them in various situations.

Hæmatocolpos occurs in imperforate conditions of the hymen and the lower portion of the vagina, under the form of a tumor which fills the cavity and exerts pressure on the rectum and bulges forward the membrane which limits it at the vulva. The uterus is pushed upward and at first only the cervix is distended, the cavity of the fundus resisting for a long time. Bimanual palpation and rectal touch perceive fluctuation, but the small hard tumor which surmounts the collection, which is the non-dilated portion of the uterus, often causes hesitation in diagnosis (Fig. 164).

When the inferior portion of the vagina is lacking, the collection is limited to the part about the cervix, but here also the uterus is not at first dilated, and if it become so it is only after the lapse of some time. When the pouch is opened and the fluid removed, the finger perceives no demarcation between the vagina and the distended cervix.

That hæmatometra may develop, the cavity of the uterus must alone receive the blood which accumulates; this occurs when the entire vagina is absent or when the internal os is occluded. Then the

uterus becomes transformed into a pouch with fairly thick walls, seldom thinned, where fundus and cervix are continuous. If the atresia is at the internal os, the fundus alone may dilate and the cervix preserve its normal proportions (Fig. 165). In all cases of hæmatometra, and in many of hæmatocolpos, the tubes also are dilated, and we have hæmato-salpinx. The blood in the tubes does not come from reflux from the uterus, as is proved by the fact that there may be no communication between the two collections and that the former may be found by itself.[1] We cannot refuse to admit that the blood in the tubes has come from the mucous membrane of the part, for its own discharge coincides with that from the uterus during menstruation. As the walls of the tubes are thinner, they may be widely distended

FIG. 164.—HÆMATOCOLPOS FROM ATRESIA OF THE HYMEN (SCHRÖDER).

FIG. 165.—HÆMATOMETRA FROM ATRESIA OF THE INTERNAL OS.

when the pressure in the genital canal increases by the occlusion of the lower portion of the vagina, while the thick walls of the uterus resist for a long time.

These irregular and twisted tumors of the tube may acquire an enormous size. Small quantities of blood escape from time to time by the abdominal end, and produce attacks of pelvic peritonitis (perimetro-salpingitis). If the amount of blood in the perineal cavity is large, it may not be absorbed, and then we have pelvic hæmatocele, which may coexist with general peritonitis.

The contents of these pouches, formed by the retention of the menses, will generally be thickened blood of a chocolate-color and a syrupy consistency like tar, with its red corpuscles very much distorted. After puncture, the pouch may suppurate and transform the

case into one of pyocolpos or pyometra;[2] decomposition of the fluid may produce gases and physometra.

Besides the tumor which appears at puberty and gradually enlarges, we usually find pain at the time of menstruation in the form of colic, which is attributed to the distention and the escape of blood into the peritoneum. The pain becomes more frequent and then constant, causing the exhaustion of the patient.

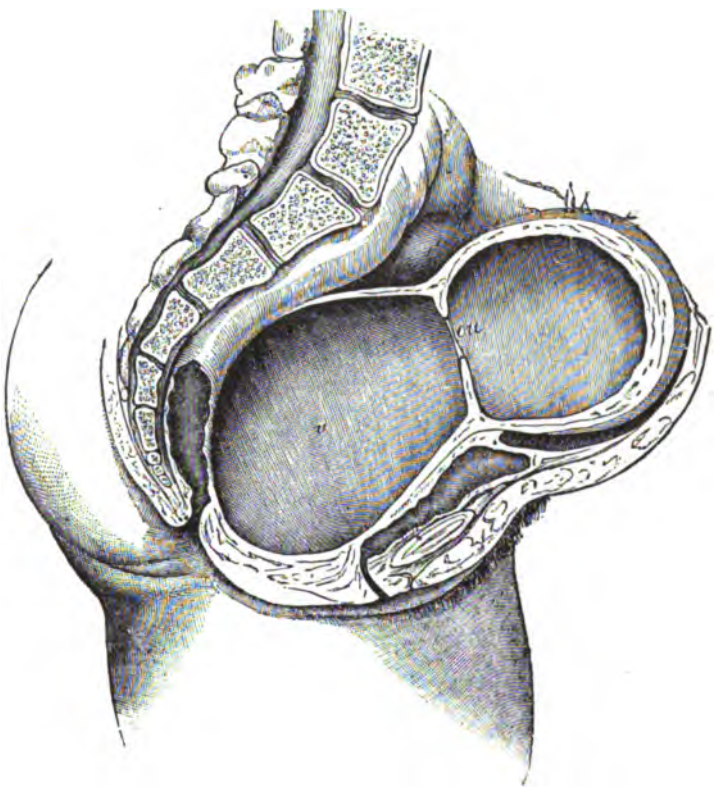

FIG. 166.—HÆMATOCOLPOS AND HÆMATOMETRA FROM ATRESIA OF THE INFERIOR PORTION OF THE VAGINA (BARNES). *v*, Distended vagina; *ou*, internal os.

In certain cases, where the flow of blood is probably very slight owing to particular conditions of the ovaries, and of the mucous membrane of the uterus, the accumulation of blood is slow and the principal symptom is the pain.[3] The menses may be supplied by vicarious hemorrhages taking place at different points, and thus preventing the formation of hæmatometra.[4] Finally, the obliteration of the genital canal has at times coincided with a real or apparent amenorrhœa; certain patients suffer only at the menstrual periods,

and there are others where there is no pain, where the ovaries probably do not functionate.

Diagnosis.—The absence of the menses, the imperforation more or less accessible to examination, and the appearance of a tumor which occupies the normal position of the genital cavities are the signs which together are pathognomonic.

Atresiæ at the hymen and a little behind it are often confounded, as I have stated (p. 446), without any practical importance in the mistake. In either case the membrane is depressible, although so thick that spontaneous perforation is very rare. The vulva and the perineum are prominent, their tension being comparable to that of the membranes before parturition.

The examination of the uterine and tubal tumors should be undertaken with care and without insisting on finding fluctuation, for fear of producing rupture. This symptom may in any case be absent; when the pouch is very tense, it is simply elastic.

There may be very grave doubts when there is hæmatometra from atresia of the internal os with a normal cervix; then we have to decide between pregnancy, fibroma, cancer of the fundus, and the hæmatometra, according to the signs proper to each and the statements of the patient.

Where there is complete or partial division of the canal by a septum, the difficulties in the way of diagnosis are very great for hæmatocolpos and hæmatometra of one side. Lateral hæmatocolpos does not form a tumor which coincides with the vagina, but on account of an evolution, which Breisky has well described, it undergoes a semi-spiral torsion, so that its lower portion may be anterior and its upper posterior, or *vice versa*. Cystocele, vaginal cyst, vaginal enterocele, thrombus, and retro-uterine hæmatocele could hardly be confounded with hæmatometra or hæmatocolpos if proper care were exercised. The difficulty is, however, great when, with a divided vagina, the accumulation of blood takes place in one segment of a bicornate bilocular or didelphic uterus. We should endeavor carefully to mark out the limits of the tumor by the aid of bimanual palpation, and to discover the non-dilated portion of the organ, which is generally pushed far to the side. It is especially in the case of hæmatometra of a rudimentary cornu that there would be doubt, and a danger of mistaking it for a cystic tube, all the more if the other tube were dilated; fibroma should also be excluded. Pregnancy may occur in the free portion of the uterus and complicate the signs still more. Exploratory punc-

ture I consider very dangerous, and prefer exploratory incision if necessary in a doubtful case.[5]

Prognosis.—Left to themselves, collections of blood from atresiæ of the genital canal are very serious.[6] Spontaneous evacuation does not produce a cure, but only a temporary relief, followed later by a return of the retention symptoms aggravated by suppuration. The spontaneous perforation is also generally insufficient, and quickly closes after permitting a partial evacuation and also the infection of the sac. When, as seldom happens, the accumulation is voided through an adjacent organ, like the intestine or even the stomach, the

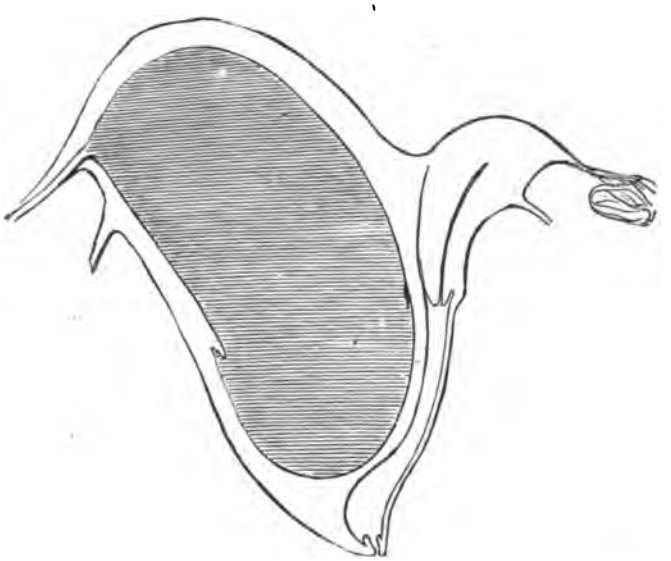

FIG. 167.—LATERAL HÆMATOCOLPOS AND HÆMATOMETRA, WITH DOUBLE UTERUS AND VAGINA, FROM COMPLETE ATRESIA OF ONE OF THE VAGINÆ AND IMPERFORATE SEPTUM IN THE GENITAL CANAL; DIAGRAMMATIC (MARTIN).

result is not the less fatal; renewed menstruation fills the pouch again and the patient succumbs. Death occurs from septicæmia after spontaneous rupture of the sac or from peritonitis after opening into the peritoneum.

In atresia of a single segment of a double canal, the prognosis is not so grave; lateral hæmatocolpos frequently terminates by rupture into the permeable vagina at the intra-cervical septum. But the suppuration of this cavity, which generally occurs, causes a pyocolpos which may be fatal if the opening is not freely enlarged. In partial hæmatometra of a rudimentary segment, the accumulation of blood may cease and the tumor remain stationary.

Before the period of antiseptics, opening a large collection of blood in the genital canal was frequently followed by septicæmia, whether the operation was a free incision without sufficient cleansing of the sac afterward, or a simple puncture with the idea of preventing the entrance of the air, which was held responsible for all accidents, or to avoid the hasty removal of the pressure, which was considered the cause of internal rupture. These accidents are, as a matter of fact, produced by other causes, either primarily by too violent exploration, or, secondarily, from alteration in the wall of the sac as the result of septicæmia. The gravity of the operation has been considered

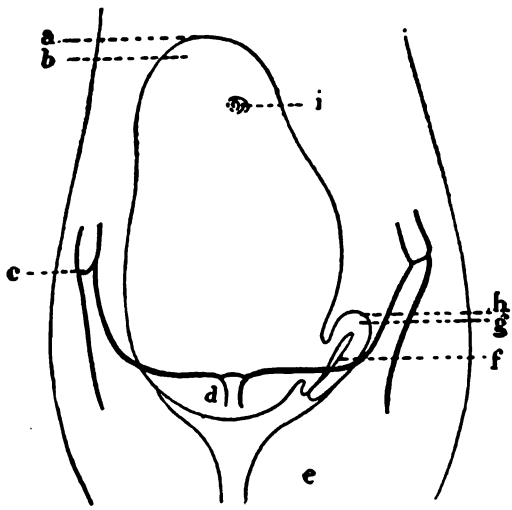

FIG. 168.—LATERAL HÆMATOMETRA IN A SEGMENT OF A DOUBLE UTERUS; DIAGRAMMATIC (STRAUDE). *a*, *b*, Insertion of the right tube and round ligament; *c*, iliac bone; *d*, symphysis; *f*, uterus; *g*, *h*, insertion of left tube and round ligament; *i*, umbilicus.

so great that Boyer, Dupuytren, and Cazeaux have advised against it; and within recent years interference was strongly opposed.[7] But many successful cases prove that it is not an operation which is necessarily fatal if we proceed boldly and antiseptically; consequently, the therapeutic prognosis is completely changed.

Treatment.—1. *Total Hæmatocolpos and Partial (Cervical) Hæmatometra; Atresia at the Hymen or Behind it.*—Simple puncture not followed in the same session by incision appears to be a prudent operation, but it is really very grave and rash as it exposes to suppuration.[8] We should therefore begin by slowly evacuating the fluid by a very small opening, a simple puncture with the bistoury, letting it escape gently for a half or a whole hour; then the incision should

be enlarged in the form of a cross. It is worse than useless to excise the obturating membrane. The sac must be cleaned[9] out with weak antiseptic solutions delivered with little force and the vagina lightly packed with iodoform gauze.

It has been objected to this manner of slowly but progressively evacuating the fluid that the tubes might be ruptured if they were distended and adherent to the adjacent parts; but this distention is very rare in hæmatocolpos with the atresia inferior, and the danger of rupturing the tubes is not so great when their walls are intact as it becomes by temporizing until they are altered by a certain degree of decomposition of their contents.[10]

2. *Partial Hæmatocolpos and Partial or Complete Hæmatometra: Atresia of a Great Portion or the Whole of the Vagina.*—In this case we must proceed by an actual dissection which is very dangerous on account of the closeness of the bladder and rectum. Amussat,[11] who was the first operator bold enough to propose the creation of an artificial vagina permitting the immediate evacuation of the fluid and the regular escape of the menses afterward, operated in several sessions, each time securing the part acquired by packing it with prepared sponge; he rejected the cutting instrument, and used his fingers alone in the separation of the tissues.

It is better, however, to operate in one session, although profiting by the wise precepts of Amussat. I have already described the operation where the purpose is to make a vagina for the performance of coitus in the absence of the uterus (p. 472). When the case is one of hæmatometra, the presence of the tumor is a valuable guide in our dissection. When we arrive in its immediate vicinity, which we may recognize by rectal touch, a trocar is plunged into the fluctuating point; and as soon as it has penetrated, as is shown by the escape of the fluid, the opening should be rapidly enlarged by small cuts with a narrow-bladed bistoury on each side of the trocar.

Breisky recommends a bistoury with its blade concealed in a canula, but this instrument is not indispensable. The calibre of the canal must be maintained afterward by the use of cylinders of hard-rubber or glass.

Puncture by the rectum has been advised by Dubois, Boyer, Scanzoni, and Baker Brown,[12] but it should be rejected. Puncture or incision by the bladder, which was proposed by Simon and Spiegelberg[13] in cases where the perineal incision was too dangerous, should be taken into consideration; we could thus certainly evacuate such a col-

lection without opening the peritoneum where there was the danger of immediate rupture. But the penetration of the urine into the sac and its possible infection from cystitis, which the altered blood might produce, constitutes an actual danger.

The parasacral or pararectal incision might be utilized in these cases.

3. *Total Hæmatometra; Atresia of the Uterine Cervix.*—The obliteration may be at the external or at the internal orifice. In the latter case we begin by dilating the cervix with laminaria tents, and we attempt to introduce a sound. If this fails, or if there is atresia of the external os, we should puncture with a trocar first, and then employ the bistoury or the scissors to enlarge the opening. After repeated washing with a feeble antiseptic solution with the aid of an intra-uterine catheter, the cavities of the cervix and the fundus should be tamponed with iodoform gauze, and thus an exaggerated degree of dilatation maintained for a few days. Afterward a glass canula or a cross-shaped rubber tube should be left in the uterus for a long time. When the uterus returns to its normal dimensions, the metritis which is the consequence of the first lesion should be treated by the curette.

4. *Lateral Hæmatocolpos and Hæmatometra; Atresia of Part of a Double Canal.*—All these lesions which I have passed in review may exist in one half of a double genital canal. No special indications are found; the precepts already formulated apply here also.

In lateral hæmatocolpos, Schröder advises not to excise the septum too freely so that the penis may not pass into the vagina which was occluded, to avoid a pregnancy on that side; such a precaution seems to me illusory, for the spermatozoa find their way into the smallest openings. It appears to me preferable to excise the septum as freely as possible and transform the double vagina into a single canal.

There is a great difficulty in the treatment, as in the diagnosis, where there is an accumulation in a rudimentary cornu with a pedicle, which is often elongated, thus forming a tumor which appears to be independent of the uterus. It has been advised to reach the collection through the vagina, and Hegar recommends the practice, either by the cautery or by incision of the cul-de-sac and iodoform tamponing carried up to the tumor to provoke adhesions. This seems to me more dangerous than laparatomy followed by the ablation of the cornu and the corresponding tube, which is distended by the blood.[14] If extensive adhesions render the ablation too dangerous, we may suture the

sac to the abdominal wall, open it, and provoke its obliteration by granulation.[15]

Hysterectomy could also be performed in certain cases of bicorn uterus. The tumor is generally easy to furnish with a pedicle at the cervix, which is fixed externally. I think that this operation should be reserved for those cases where it is not easy to reach the tumor by perineal dissection and those where the evacuation of the blood offers difficulties from the solidification of the contents of the sac, which may be transformed into fibrous masses,[16] as in a case of Jeannel's. Hysterectomy might be done immediately if the conditions could be recognized beforehand, or it could follow the attempt to evacuate by the vagina. Manœuvres through this canal must not be too prolonged, for they cause pressure which may rupture the tubal dilatation. Hysterectomy has been performed with success by John Homans [17] for a case of lateral hæmatometra in the bicorn uterus.

5. *Hæmato-salpinx.*—The hæmato-salpinx which so often complicates atresiæ of the genital canal should not be neglected, for the rupture of a thin-walled collection may produce death. Fuld [18] has collected 66 cases of atresia, either congenital or acquired, where the accident has occurred, and in 48 of them it was followed by death. Among these, 39 had followed a previous operation, and 9 occurred without surgical interference. Hæmato-salpinx existed in 27 where there was atresia without a septum, and 12 where the canal was double.

In order to appreciate the operative indications, we must know the natural evolution of a tubal collection after the vaginal or uterine tumor has been evacuated. In many cases, if the way of escape provided is sufficiently large and well maintained, the hæmato-salpinx empties itself and disappears.[19] But there are cases where the tumor of the tube suffered no change or where it was renewed at every menstrual period; it is in these cases that we must operate; salpingotomy has given good results in the hands of Sutugin.[20]

Simple evacuation of the hæmato-salpinx by puncture has been proposed; but though less important in appearance, this is really more dangerous than ablation. Puncture by the vaginal pouches (Kaltenbach, Rennert, Alberti, P. Müller, H. Bertram) has been followed by success, but there is a risk of injury to the intestines and of effusion of blood into the peritoneum, as well as of suppuration of the sac. Puncture through the abdominal wall (Hausmann) is open to the same objections.

There is one other occasion when salpingotomy is required. It is

when, after or before operation upon the vagina and uterus which are the seat of atresia, the tumor of the tube suddenly disappears without the external issue of a corresponding amount of blood; it is then very probable that rupture has occurred into the peritoneum; symptoms of grave internal hemorrhage render the diagnosis certain and demand immediate laparatomy.

BIBLIOGRAPHY AND NOTES.

1. Gosselin: Gaz. des Hôpit., 1867, No. 57. Many analogous cases have been published since then.

2. Exceptionally the accumulation is mucous. Godefroy (Gaz. des Hôp., 1856, No. 42) has observed such a collection, behind an imperforate hymen in a child of two months, where the rectum and urethra were compressed. Breisky has observed a similar case in the new-born and was convinced that the thin obstructing membrane was not the hymen, but behind it. Bryck (Wien. med. Woch., 1865, No. 11) found mucus instead of blood in a girl of 18; Veit the same in a young woman of 23 (case published by Stroetter: Inaug Dissert., p. 26). Collections of blood may become infected and suppurate in a manner that is difficult to explain with imperforate hymen, as in Rheinstadter's case (Primärer Pyocolpos und Pyometria bei einem 13jährigen, etc., in Centr. f. Gyn., 1890, No. 9).

3. Polaillon: Bull. de la Soc. de Chir., 1881.

4. Le Fort: Man. de Méd. Op. de Malgaigne, 9th ed., 1889.

5. Ssolowjew (Obstet. and Gyn. Soc. of St. Petersberg, February 23d, 1888, in Cent. f. Gyn., 1888, No. 50) reports a case where exploratory incision was performed by Slavjansky in superior hæmatocolpos and cervical hæmatometra in order to decide the topography of the lesion; after which the abdomen was closed and the fluid evacuated by the vagina. Slavjansky advises this procedure when there is doubt as to the seat of the collection.

6. Desprès: Rétention des Règles, etc. Bull. Soc. Chir., 1886, p. 39. A curious case of hæmatometra in a girl of 14 years without hæmatocolpos, due probably to atresia of the cervix; spontaneous evacuation; Desprès therefore abstained from all operation. But as the patient was not followed more than a month we do not know whether the tumor was reproduced, as was likely.

7. Gilette: Annal. de Gyn., May and July, 1874. Delaunay: Paris Thesis, 1877. Guéniot: Report on an Article by Boem. Bull. Soc. Chir., 1878, p. 509.

8. Defontaine: Sur un Cas d'Imperf. de l'Hymen, etc., in Terrier, Bull. Soc. Chir., 1886, p. 745. A case of suppuration caused by puncture.

9. This procedure is recommended by Hegar and Kaltenbach, Breisky, and others. Segond: Imperfor. Congén. de l'Hymen. Bull. Soc. Chir., 1885, p. 840. Report by Berger, ibid., p. 831.

10. In this case of Gosselin's, which is often cited, the tubal perforation did not occur until the third day after the attempt to form an artificial vagina; there was probably some septicæmia.

11. Amussat: Observat. sur une Opérat. de Vagin Artific., Paris, 1838.

12. Baker Brown: Surgical Diseases of Women, 3d edit., p. 284.

13. Simon: Berlin. klin. Woch., 1875, No. 20.

14. Leopold: Ueber Blutansammlung in verschlos. uterovag. Kanale, etc. Arch. f. Gyn., 1889, Bd. xxxiv., Heft 3.

15. Howitz: Centr. f. Gyn., 1882. p. 271.

16. Jeannel: Bull. Soc. Chir., 1887, p. 505. Report of Berger: Patient suc-

cumbed immediately after operation, apparently from internal hemorrhage, from rupture of hæmato-salpinx caused by long manœuvres (two hours) and pressure over the abdomen ; the tumor (hæmatometra in left segment of bicorn uterus) was very large and full of solid clots.

17. John Homans: Boston Med. and Surg. Journ., Sept. 8th, 1885.

18. Fuld: Die Salpingotomie wegen Hämatosalpinx, etc. Archiv f. Gyn., Bd. xxxiv., Heft 2. Leopold: Ueber Blutansammlung in verschlos. uterovagin. Kanale, etc. Ibid., Heft 3.

19. Aman: Ein Fall von Atresia hymenal., etc. Münchener med. Woch., 1888, No. 52. Spontaneous disappearance of the hæmato-salpinx after evacuation of the hæmatocolpos and hæmatometra.

20. Sutugin: Wratsch, 1888, No. 24, p. 466, Observ. 24. Chapman: Edinb. Med. Journ., 1884–85, vol. xxx., p. 204. Terrillon: Revue de Chir., 1887, vol. vii., p. 71; and Bull. de Thérapeut., 1887, p. 390. These surgeons, cited by Fuld a little inappropriately for his purpose, have operated on hæmato-salpinx after acquired contractions and not in congenital atresia. Leopold: Archiv f. Gyn., 1889, Bd. xxxiv., Heft 3. Case of prophylactic salpingotomy in a case of bicorn uterus, where there was interstitial hypertrophic salpingitis producing pain. Such dissimilar cases should not be compared.

CHAPTER XXVII.

DISORDERS OF THE URINARY TRACT.[1]

DISEASES OF THE BLADDER.—*Pathology.*—Inflammation, foreign bodies, and tumors constitute the threefold etiology of diseases of the bladder.

Inflammation may be primary or a local manifestation of a tubercular diathesis.

Foreign bodies may be of external origin, introduced through the urethra, or may be developed within the bladder, in which case they are designated calculi.

The study of vesical pathology will therefore include: 1. Cystitis; 2. The tubercular variety of cystitis; 3. Calculi; 4. Foreign bodies; 5. Tumors.

1. CYSTITIS.—*Etiology and Pathogenesis.*—Anatomy teaches us that the vascular system of the bladder has extensive and intimate connection with the network of vessels found in the substance and upon the surface of the uterus. This fact explains the frequent coincidence and reciprocal influence of congestions manifested in the two organs. We all know that during the menstrual period women frequently suffer from disorders in micturition; and that if this congested condition of the uterus become intensified by reason of metritis and peri-uterine affections, the bladder will undergo pathological modifications due to the same cause.

The various deviations and displacements of the uterus, and its enlargement whether from pregnancy or the growth of a tumor, may also by compression cause difficulty in the evacuation of the bladder, with consequent partial retention of the urine, which by its decomposition irritates the vesical walls and sets up a cystitis. Among exciting causes are to be mentioned cold, the ingestion of certain substances, especially spices, and alcoholic drinks.

Cystitis is a frequent sequela to labor. To explain its occurrence the opinion was formerly held that inflammation was propagated

[1] This and the following chapter have been taken from Auvard's recent and most excellent work, entitled "Traité Pratique de Gynécologie," and published by Octave Doin, Paris, 1892.—B. H. W.

from some cervical lesion; at the present day, however, the tendency is toward belief in an infectious element (diplococcus) introduced through the urethra. The frequent use of the catheter easily explains the entrance of microbes into the bladder.

Puerperal cystitis may be of slight or of great intensity. Of small importance during pregnancy, if developed after labor it is usually of a severe type and obstinate as regards treatment. Exceptions to this rule, of course, exist.

All practitioners will recall the vesical complications attending retroversion of a gravid uterus, the cystitis sometimes going on to gangrene. With the catheter a few drops only of urine are obtainable; the flow stops, interfered with by sphacelated tissues thrown off through the urethra as gray membranous shreds. Hypogastric pain, chills, fever, and prostration accompany this process.

One of the marked characteristics of cystitis in women is its chronic course and the difficulty with which it yields to treatment.

Symptoms.—Cystitis is, as a usual thing, described under two heads—the acute and the chronic form. A careful study of the symptoms and the development of the two conditions show that in reality there is but one disease. Sometimes the onset is sudden, while at other times it may be slow and insidious, the disease becoming established for a shorter or longer period without passing through an acute stage. Be this as it may, we shall for convenience' sake preserve the time-honored classification.

a. Acute cystitis is ushered in by pains which are most pronounced during micturition. In the intervals, the patient is conscious of a heaviness and sense of fulness, which, ill defined at first, soon becomes marked and urgent in character. If an effort be made to retain the urine, the perineum and anus become the seat of violent shooting pains; after a while the urine escapes, a spasmodic contraction seizing all the muscles which participate in the effort.

Painful rectal tenesmus is superadded to this vesical tenesmus, while a burning, lancinating pain, compared by some patients to the touch of a red-hot iron, is felt in the urethra. The intensity of the symptoms gradually subsides, but malaise and lassitude continue. At the end of an hour, or much less in severe cases, another severe attack of pain comes on. The intervals between these attacks are sometimes so short that the pain seems continuous.

Palpation, rectal and vaginal touch, are exceedingly painful; they reveal a slight distention of the bladder.

The quantity of urine is diminished. If allowed to stand, a gray cloudiness may be observed at the bottom of the vessel. When cystitis is very acute and intense, the urine becomes of a dark red color, and is found to contain pus, mucus, blood, and crystals of uric acid.

The endoscope may aid us in acquiring a knowledge of the internal lesions found in cystitis. The mucous membrane is congested, and in places mottled by petechial spots. The local condition is often accompanied by serious general phenomena, such as nervous excitement, insomnia, and anorexia, and, if the patient neglect rational treatment, emaciation and loss of strength. The older writers lay great stress upon fever as being constantly concomitant to cystitis. Guyon, on the other hand, asserts that uncomplicated cystitis, however intense it may be, never gives rise to elevation of temperature.

Complete or partial retention is of frequent occurrence. In the former case distention of the bladder causes paroxysmal pain; in the latter the diagnosis is often overlooked, because the patients urinate frequently, without, however, emptying the bladder.

Incontinence of urine is never met with in acute cystitis.

The course and duration of the attack are variable. Sometimes the symptoms described subside at the end of a few days; sometimes they continue for weeks, with exacerbations and remissions. Generally speaking, it may be said that the course and the method of termination of the disease are different in each variety of cystitis.

b. Chronic cystitis is merely a cystitis which is of protracted duration, and which does not yield readily to treatment. The symptoms are the same as those described above, but somewhat modified. The pain is less severe, more pronounced at the beginning of micturition, and preceded by a sense of heaviness just above the pubis. It is usually of short duration, but in cases of long standing may last for a while after micturition. A temporary suspension of treatment will cause an attack of acute cystitis to engraft itself, as it were, upon the chronic form. Micturition becomes increasingly frequent, but is often attended with some difficulty; large flakes of mucus float in the urine, obstructing the flow.

If the catheter be introduced (which should be done with the utmost precautions), it will be seen that the urine when first passed is clear, and gradually becomes more and more cloudy and thickened, until it has the aspect and consistency of pus. If the affection have been of long standing, blood, pus, and crystals of uric acid are found in addition to the mucus.

A microscopic examination demonstrates the presence of leucocytes in varying numbers, and epithelial cells. If the urine be allowed to stand, a yellowish-gray deposit will soon form at the bottom, but the supernatant fluid does not become quite limpid; the slight cloudiness is probably due to an admixture of mucus, or to some renal complication. The urine undergoes an alkaline fermentation, due to the action of bacteria.

These local phenomena may sooner or later react upon the general condition. The patient is easily tired, then loses her appetite; emaciation and cachexia follow. Repeated inflammatory attacks greatly aggravate the condition; fever, chills, and diarrhœa supervene, profuse sweating, and finally death. As a usual thing, however, cystitis alone rarely leads to a fatal result, which is generally due to infectious pyelo-nephritis.

The diagnosis of chronic cystitis is not difficult; it will be recognized by the frequent micturition with accompanying pain, by the alkaline reaction of the urine, and the presence of muco-pus. In simple cystalgia, we find frequent micturition and pain, but the urine is clear, there being no pus, blood, nor excess of mucus.

Pyelo-nephritis may be mistaken for cystitis; to clear the diagnosis, the bladder should be carefully washed out, a catheter introduced, and the urine be allowed to pass through it drop by drop. In cystitis the fluid will be clear, in pyelitis or pyelo-nephritis it will, on the contrary, have already become altered in quality.

The establishment of a diagnosis is not sufficient; the cause and the variety of the cystitis must be known. The gynæcologist must bear in mind the various chronic inflammations of the bladder.

Gonorrhœal cystitis due to a transmission of the virus through the urethra may follow the careless use of the catheter, but is more often the sequela of a gonorrhœal urethritis; it rarely appears in the early stage of infection, and usually reaches its maximum of intensity only after a certain length of time, several weeks, even. The three chief symptoms—frequent micturition, pain, and change in quality of the urine—are present in an aggravated form. In acute attacks the pain is agonizing and the necessity for evacuation urgent, while hæmaturia is almost a constant symptom; the blood is rarely profuse, however. Gonorrhœal cystitis does not often assume this severe type, the symptoms are usually milder and often limited to tenesmus. The urine contains fragments of muco-pus, due to concomitant urethritis; the microscope will reveal the presence of the gonococcus.

Tubercular cystitis has some symptoms in common with gonorrhœal cystitis, and with the inflammation caused by calculi and by the growth of tumors within the bladder.

Hæmaturia is a constant symptom in all these varieties of cystitis, but in tuberculosis of the bladder it possesses special characteristics. It comes on early in the disease, and the blood is usually mingled with the last drops of urine which are passed, but may exist in greater amount. Strangely enough, it diminishes as the disease advances.

Other symptoms common to the various forms of cystitis are: pain, urethral spasm, retention and incontinence of urine. The diagnosis is cleared by the finding of Koch's bacillus, but its identification demands long, delicate, and difficult research.

The physical signs should be carefully studied. It is better not to use any instruments, as these may be the starting-point of severe complications. One condition alone justifies the use of the sound; that is, the probable existence of a stricture.

Vaginal and rectal examination will show whether there be sensitiveness of the base of the bladder, and any induration of the surrounding parts. When the supra-pubic portion is depressed, pain is often caused by the removal of the hand, especially if it be done suddenly.

The symptoms of cystitis due to neoplasms of the bladder are also pain, disorders of micturition, and, above all, hæmaturia; each symptom, however, possesses special characteristics which greatly aid in establishing the diagnosis.

Hæmaturia in the case of vesical tumors appears early in the disease, but is unaccompanied by pain, tenesmus, or frequent desire to micturate, and may be unnoticed by the patient. There is, however, an abundant discharge of blood; the urine is strongly colored by it during the whole duration of the flow, but the blood increases in amount toward the end. Hæmaturia may continue for days, weeks, and months; it may suddenly cease, to reappear later.

The fragments of the tumor often found in the urine would seem to be useful in clearing the diagnosis; unfortunately, they are neither constant nor of a well-marked character. Pain comes on at a late stage in the disease.

It is often quite impossible to determine the exact nature of a vesical neoplasm; even the use of the microscope in examining the

discharged fragments may be of little use, as the superficial layers of the tumor are often entirely different from the deep layers.

Dilatation of the urethra and direct exploration of the bladder will determine the site of the tumor.

Calculous cystitis is caused by the presence of a foreign body; while pre-existing cystitis is greatly aggravated by it. The slightest motion causes exquisite pain, the desire to void the urine occurs with extreme frequency, and is accompanied by violent expulsive efforts. Hæmaturia occurs as a result of great fatigue, or from the jolting motion of a carriage, etc.

Cystitis caused by the ingestion of such medicines as the sulphate of quinine, the iodides, an excess of balsamics, the application of thapsia and vesicants, is shown by a notable increase or diminution in the amount of urine. Micturition is painful, frequent, and accompanied by tenesmus. In even the most benign cases, pus is found in the urine; in severe cases pseudo-membranes form upon the inner surface of the vesical walls. At the same time the urine undergoes special modifications: it becomes alkaline, purulent, fetid in the extreme; shreds of mucous membrane are discharged, and sometimes accumulate to such an extent as to delay or prevent the passage of the urine. In case of such retention, serious phenomena may supervene. The bladder absorbs the toxic elements contained in the decomposed urine, and general poisoning follows. The vesical walls may also be so affected in cases of severe inflammation as to easily rupture.

The general course of the different forms of cystitis varies greatly. In the gonorrhœal variety, it may last from three days to two or three weeks; sometimes there is no tendency toward improvement, the disease yields to no treatment, and acute exacerbations occur from time to time. Tubercular cystitis may even supervene.

The course of tubercular cystitis differs according to whether it be primary or follow upon a pre-existing inflammation. In the former case the bladder is extremely irritable, micturition is frequent, painful, and followed by the expulsion of several drops of blood. These symptoms may seem to subside, and may even disappear for a while, giving the patient a respite, but usually the calm is of short duration, and is followed by an aggravated attack.

If there have been pre-existing inflammation, the tubercular nature of the malady is often unsuspected. The same pathological picture is presented; hæmaturia is sometimes more pronounced. The course

of the disease will be more rapid, especially should there be suppuration, fistulæ, or any of the accidents attending pyelo-nephritis.

The course of cystitis accompanying the growth of tumors depends altogether upon the condition of the walls of the bladder. In cases of benign tumors, it may be extremely slow. If the ureter and pelvis of the kidney are involved, rapidly developed symptoms of uræmia will follow. As the disease advances, the patient becomes cachectic in proportion as the tumor develops a malignant character and as hæmaturia becomes more abundant.

The course of calculous cystitis depends upon the growth of the calculus, the mode of life and diet of the patient, but, even outside of these special conditions, the vesical lesion and the partial retention of urine will finally determine renal complications and general intoxication.

The prognosis of cystitis is doubtful as regards perfect cure; more so in some of its varieties than in others, but it always demands careful treatment.

The results to be aimed at in treatment are the following:

1. Removal or amelioration of the cause when it can be found.
2. Relief of pain.
3. Improvement of the general condition.

To meet these indications, various means may be resorted to.

If cystitis is caused by metritis, uterine displacement, or peri-uterine inflammation, treat the cause.

If the inflammation is a symptom of gonorrhœal infection, give diuretics: oil of birch, borage, triticum. Wash out the bladder frequently with antiseptic solutions, as a four-per-cent solution of boric acid, or nitrate of silver 1:500. In obstinate cases the instillation of from twenty to thirty drops of a solution of nitrate of silver, 1:50, will be useful. Suppositories of belladonna or other antispasmodics will ease the pain. In the tubercular form, a free evacuation of the urine and rest to the bladder are to be aimed at. To accomplish these results, dilatation of the urethra or vaginal cystotomy may be resorted to.

Forcible dilatation of the urethra is done by the fingers or by instruments, such as Hegar's bougies, or branched dilators. Great care is to be exercised, whatever the method chosen, and it is a good plan to precede the operation with the insertion of a catheter, leaving it in place for two or three days, and giving antiseptic injections.

Dilatation of the urethra often fails and frequently causes rup-

ture, lacerations, and hemorrhage. At the present day, colpocystotomy is generally preferred, and is done in the following manner:

The patient being anæsthetized and placed in the dorsal position, the posterior commissure of the vulva is drawn down and the vesico-vaginal septum is made to bulge forward by means of a grooved catheter introduced through the urethra. The assistant holds this catheter in the median line, so as to avoid wounding the ureter, and the surgeon makes an incision into the vaginal wall about one centimetre behind the neck of the bladder, guiding himself by the index finger of the left hand, which is placed upon the catheter.

To prevent union of the lips of the wound, the vesical and vaginal mucous membrane may be sutured together.

Cystotomy is a useful operation, especially in cases where pain is a prominent symptom.

Quite lately M. Bazy has endeavored to cure obstinate cases of cystitis, complicated by the formation of pseudo-membranes and abundant secretions, by the two popular operations of modern gynæcology, curetting and swabbing out of the cavity. He uses a lithotrite with fenestrated jaws, which he opens so as to leave a space about one centimetre between the jaws, and inserts it into the base of the bladder, carrying it upon the lateral walls, and by oscillatory motions endeavoring to scrape the posterior wall. He claims to have obtained most excellent results from this procedure. Where there is much mucus present, Bazy prefers swabbing out the cavity, and uses an instrument of his own devising, which consists of a catheter with a slight curvature, at the vesical end of which are two large openings from which protrude the meshes of a cloth mop.

2. TUBERCULOSIS OF THE BLADDER.—*Etiology.*—This affection may be the primary manifestation of infection by the bacillus, or it may simply be an additional symptom to the chief phenomena of the disease. It is met with at all ages, and in men more frequently than in women.

Pathology.—Inflammations of the bladder, calculi, and gonorrhœal urethritis create a soil favorable to the development of the bacillus, but it is difficult to estimate the exact moment when simple cystitis becomes tubercular. Authorities differ as to the manner in which the organism reaches the bladder. Some (Verneuil, Verchère) believe the genital organs or the urethra to be the source; others claim that the bacillus circulating in the blood reaches the glomeruli of the kidneys and finally the urinary tract. It may remain quiescent for a

long time, and be started into activity by the inflammation of some organ, which speedily becomes the seat of tuberculosis.

Pathological Anatomy.—The bladder is usually small, shrivelled behind the pubis, about the size of an egg, and contains a few grams of urine. The muscle and connective-tissue fibres of the vesical wall are hypertrophied; sometimes sclerosis causes atrophy of the muscular fibres, in which case the bladder loses its flexibility, elasticity, and power of expansion.

By the side of the lesions found in Lieutaud's triangle, which are in the form of grayish granulations, isolated or in groups, are found some which have undergone caseous degeneration or ulceration. They may be in the neck, the trigone, or at the openings of the ureters, and are sometimes small, superficial, and surrounded or covered by little grayish granulations, sometimes so deep as to expose the muscular layer. In some cases the lesions are so extensive as to involve the ureters, the pelves, the calyces, and even the substance of the kidneys themselves. The kidney is then enlarged, indented, and contains cavities in the substance of the pyramids.

The peri-vesical cellular tissue may become the seat of tubercles; small cavities are found filled with pus which gradually extend to neighboring organs.

The symptoms are very characteristic. One of the earliest to appear is frequency in micturition, which may go so far as to prevent all sleep or rest; every change in position causes the desire to pass urine, which is due to the contact of the fluid with the diseased mucosa of the neck of the bladder. The bladder becomes irritable, and will tolerate but a small quantity of urine at a time, whence the necessity for frequent evacuation; at the same time a violent spasm of the neck of the bladder greatly impedes the emission of urine. Pain may persist after micturition, so as to become continuous, the patient complaining of a sensation of disturbance accompanied by burning. Pressure on the hypogastrium, walking, and driving aggravate the discomfort.

At the end of an evacuation of urine the pain is excessive, and a few drops of blood are passed; sometimes the urine is turgid with blood throughout, and there may even be formation of clots, which, of course, might lead to a retention of urine. Contrary to what has been noticed in the case of cystitis due to calculi, the hæmaturia does not disappear as a result of rest, and may last days or weeks with intermissions.

When the tubercular disease of the bladder is established, hæmaturia is less frequent, but the urine becomes clouded with pus, which may appear at any time during micturition. It increases in amount with the progress of the lesions. Polyuria may set in, due to reflex irritation or to degeneration of the kidney, the latter occurring toward the end of the disease.

The physical signs to which vesical tuberculosis gives rise are the following:

Palpation or light pressure of the hypogastrium causes sharp pain.

In some patients pain is produced only when the hand is removed very suddenly after light pressure on the abdominal wall.

Terrillon considers polypoid excrescences about the urethral orifice to be characteristic of vesical tuberculosis.

Vaginal examination will give information as to the condition of the vesical wall, its thickness, induration, and sensitiveness. Examination of the urine shows the presence of red corpuscles, leucocytes, cells whose origin is the mucosa of the bladder, ureters, and pelves, and sometimes the bacillus.

The course of tuberculosis of the bladder is irregular. When it is a primary manifestation, the general health often remains good for an extended period, but a time comes when micturition becomes more and more frequent, painful, and accompanied by hæmaturia. When cystitis complicates the original disease, the general condition rapidly deteriorates. In the cases where tuberculosis of any important organ become complicated by secondary tuberculosis of the bladder, the lesions of the latter organ develop with great rapidity.

The duration of the disease may be approximately estimated at from one to two years, but cases have been known in which it lasted from five to ten years without affecting the general health.

Prognosis, then, is bad for secondary tuberculosis of the bladder, and relatively better for the primary affection.

Diagnosis would be easy were the bacillus always to be found in the urine; as it is, we are obliged to depend upon the symptoms to distinguish tuberculosis of the bladder from the other varieties of inflammation. The differential diagnosis from gonorrhœal cystitis is often difficult. The absence of pain in the intervals of micturition will serve to distinguish it.

In cystitis from calculi, the patients suffer pain and lose blood only after fatiguing efforts, or jolting, as from riding.

In the case of neoplasms of the bladder, the discharge of blood is not attended by pain; it is only toward the end of the disease that the patient suffers.

Treatment should be both medical and surgical. Cod-liver oil and creasote may be administered, pain is to be met by subcutaneous injections of morphine and by antispasmodics, hæmaturia by injections of tannin and by ice. If these means fail, the urethra and neck of the bladder may be dilated, and, if necessary, an incision can be made.

3. VESICAL CALCULI.—*Etiology.*—It is estimated that calculi are met with in the female five times to every hundred times in the male. The greater size of the female urethra partially explains this disproportion, the evacuation of the calculi being relatively easy. Besides these purely anatomical considerations, it is not unlikely that woman's mode of life and more moderate habits have an influence upon this predilection of calculi for the male sex.

They may be found at any age. According to Guyon's experience, up to fifty years of age the proportion is ten per cent; from fifty to seventy years, seventy per cent; above seventy years, twenty per cent.

The local causes are the retention of urine which finally brings about cystitis, and foreign bodies forming the nuclei of solid concretions.

Pathological Anatomy.—Calculi generally occur singly, but it is not unusual to see two, three, or more, in which case each one is of smaller size than the single calculus. The latter sometimes reach a large size. Some claim to have seen them as large as a turkey's or ostrich's egg. In Dolbeau's work upon the size and form of calculi, he mentions a case, which must be considered unique, of a stone weighing six pounds.

The shape is variable—ovoid, rounded, spherical, or polyhedral; the last-named variety occurs chiefly when there are several calculi present.

The surface is smooth or granulated; sometimes there are nipple-like or even pointed projections.

The concretions formed by oxalate of calcium are rounded and nodular; those of uric acid and the urate of ammonium are ovoid and slightly flattened, with a smooth or sometimes a granulated surface; the phosphatic stones are more irregular in shape.

The color of calculi is also influenced by their chemical composi-

tion: Phosphatic concretions are a grayish-white; oxalate of calcium, slate-colored; and uric-acid, yellow.

The consistence is likewise variable, and calculi may be found so soft as to be almost fluid, or as hard as marble. Soft stones (triple phosphate of ammonium and magnesium, and the urate of ammonium) are reduced to powder by desiccation. In hard calculi, the oxalate of calcium predominates.

Interior Structure of Calculi.—These concretions are always formed of a central nucleus and surrounding cortex. The former may consist of mucus, blood, fibrin, débris of normal or pathological tissues, and contains all the precipitated elements of the urine—uric acid, oxalates, and phosphates. A calculus cut across will often show a central cavity bounded by a black line, and within this cavity a small, solid nucleus, or one which becomes pulverized at a touch. The cortex varies greatly, being at times a mass of granulations, crystals agglutinated by a soft organic substance (granulated calculi) or formed of distinct lamellæ between which are openings and cavities that greatly diminish the consistence of the concretion (lamellated calculi).

Method of Formation.—According to Scherer, the primary cause of a precipitation of the salts consists in the two varieties of fermentation of the urine: the one decomposing the urates and setting free uric acid; the other decomposing urea into the unstable compound, carbonate of ammonium. W. Ord holds that under the influence of various colloid stubstances (mucus, coloring matters) or of albumin, sugar, blood, and pus, the substances held in solution are agglomerated and form calculi. However that may be, the calculus once formed grows in the following manner: The various solid substances dissolved in the urine are precipitated in the form of grains or of tiny scales around the nucleus, which may be a blood clot, a foreign body, etc. Some calculi grow much more rapidly than others; the phosphatic variety, for instance, may in a few months attain to a large size, while oxalic and uric acid calculi, especially if compact, may take months and years to reach even a medium size.

Lesions of the Urinary Tract Accompanying Calculi.—The shape of the bladder is often atypical; it may possess prolongations and diverticula which favor the growth of calculi. Hypertrophy of the walls has also been noticed. The internal surface of the bladder is usually altered in color, and has scattered vegetations and vascular arborizations; in rare cases the walls are perforated and the calculus

is found beneath the serous covering of the bladder. Solid concretions are usually situated upon the base of the bladder. Other lesions, such as the encysting of multiple calculi in circumscribed compartments formed by the muscular columns of the vesical wall are found almost exclusively in males suffering from urinary disorders of long standing (hypertrophy of the prostate, stricture).

Symptoms.—These are pain, disorders of micturition, hæmaturia, sudden interruption of the flow.

Pain rarely appears spontaneously, but usually as the consequence of jumping, walking, or a long carriage drive. Micturition becomes a cause of suffering as follows: So long as the bladder contains fluid, the stone is separated by it from the vesical walls, and its presence scarcely appreciated. When the bladder is empty, however, the walls are approximated and push the calculus down upon the neck, which, being exquisitely sensitive, causes reflex and painful contractions. The sensitiveness extends, until finally, instead of a mere feeling of discomfort at the perineum and end of the urethra, there is actual pain in the groin and in the lumbar region. Guyon has known cases in which the pain extended to the legs, soles of the feet, and great toe, simulating neuralgia and gout.

Micturitions are frequent; the stone may fall into the neck and cause a sudden cessation of the flow. This sign has been considered pathognomonic of calculus, but cannot be depended upon as a symptom, being very infrequent. The calculus may also penetrate into the urethra and prevent evacuation of the bladder, causing retention of urine, which disappears when the stone is displaced. Hæmaturia is a valuable symptom. As a result of a walk or a carriage drive, the patient passes a certain amount of blood intimately mixed with the urine, and this constantly occurs upon repetition of the cause.

The urine does not undergo profound alteration until the calculus has been in existence long enough to provoke cystitis. The character of the changes has already been described.

The physical signs are of great value. By vaginal touch, the calculus may often be felt if it have attained an appreciable size. Combined with palpation of the hypogastrium, it is of real service. Intra-vesical exploration is the best of all resources. A curved probe or a sound may be used, and, once inserted into the bladder, may be pushed back to the posterior wall, and, with its tip leaning to one side, drawn toward the neck again, by gliding it upon the internal surface of the bladder. The manœuvre is repeated upon the opposite side.

After that, the tip of the instrument is carried downward to explore the base of the bladder.

When the instrument comes in contact with a calculus, a rubbing, grating sensation is transmitted to the hand, and a clinking sound may be distinctly heard.

The course of the disease depends upon the condition of the bladder and the whole urinary tract. A calculus may remain *in situ* for a long time without causing any grave symptoms, and may finally be spontaneously expelled.

Prognosis and Treatment.—The prognosis is far better than in the male, and the treatment correspondingly easier. The shortness of the urethra and the possibility of reaching the bladder through the vagina permit of special interference.

But vesico-vaginal incision and lithotrity are not the only resources at hand. Dilatation and incision of the urethra are also practicable.

Dilatation may be carried to quite an extent. Paul Hybord proved that the urethra could be dilated to the diameter of four-tenths of an inch without injury; but Simon and Spiegelberg have shown that a diameter of an inch may be reached. [Dilatation may usually be safely carried to a diameter of seven-eighths of an inch. If more space is necessary vesico-vaginal incision should be preferred.]

The process may be gradual or rapid.

Gradual dilatation is accomplished by means of some substance which will swell under the influence of heat and moisture, as a laminaria tent, for instance, which can easily be rendered aseptic. The process is both painful and troublesome.

Rapid dilatation is done in one of two ways:

Simon introduces into the urethra a series of hard-rubber dilators. Reliquet opens the meatus by means of three small incisions, carries into the bladder a three-branched dilator, or else the dilator of Dolbeau [or any moderately curved uterine dilator, as Palmer's], which he gradually opens out. As soon as dilatation is complete, he introduces his finger, and with it guides the forceps which seize and withdraw the calculus.

Lithotrity upon the female is called an easy operation. The fact is beyond dispute, says M. Guyon. But if the introduction of the instrument is easy, the same cannot be said of the crushing of the stone.

The female bladder is large and flaccid, and the instrument gropes

and wanders about in it. There being no prostate gland behind which the stone may lodge, it is constantly displaced, and often has to be fruitlessly sought for a long time.

The calculus once reached, a certain amount of fluid, say four and a half ounces, is introduced into the bladder, after which the lithotrite is held upward perpendicularly to the axis of the body. It is then somewhat forcibly pressed downward when a finger introduced into the vagina will be able to feel the projecting tip of the lithotrite upon the posterior wall. A cup-like cavity is thus formed which receives the calculus, and the absence of a retro-prostatic lodgement compensated for. The existence of cystitis forms a contra-indication to this manœuvre. The stone is crushed and the bladder washed out, and then with a flat-jawed lithotrite a second crushing process is performed. The vesical wall may be caught in the jaws of the instrument, and will be shown outside by a separation of the handle. To liberate it, Guyon advises a gentle drawing forward of the handles toward the neck, without pressing upon them; the bladder by virtue of its own elasticity is gently drawn backward.

There are three varieties of incisions, the most simple being that of the urethra. The whole of the urethral canal, and the neck of the bladder, are opened by means of a lithotome with concealed blade, or a bistoury carried in upon a grooved director.

In the vesico-vaginal incision, the patient being in the dorsal position, a grooved and curved catheter is introduced into the bladder in such a way as to cause bulging of the vesico-vaginal septum. The bistoury is carried in upon the groove of the catheter. The incision should begin just back of the vesical sphincter, need not be longer than an inch, and should be median and longitudinal. Vallet and Bozemann advise a transverse incision, one of them placing it at the base of the bladder, the other just above the urethro-vesical opening.

Some surgeons use a bistoury for this operation; others a lithotome introduced through a button hole opening in the vaginal wall; others, as Emmet, use a pair of scissors.

Hypogastric incision is difficult, because it is almost impossible to make the female bladder hold sufficient fluid to cause it to rise above the pubis. The only resource is to introduce a director and push the bladder into place.

Which of these three operations is preferable? Statistics give the best results to dilatation of the urethra and lithotrity. Rapid dilatation is convenient, but has one drawback, in that it often causes inconti-

nence of urine, which is temporary in some cases, permanent in others. In young girls under fifteen years of age, dilatation is contra-indicated by the approximation of the ischio-pubic rami. Urethral incision may cause lesions of the vagina and incontinence of urine. Vesico-vaginal incision should be done only in women in whom the hymen has been destroyed. Hypogastric incision gives a wide field for the necessay manœuvres, but is difficult of execution. Rapid lithotrity is the operation to be depended upon in the majority of cases. The only contra-indication is the resistance which may be offered by the stone and prevent its crushing.

4. Foreign Bodies.—These are introduced into the bladder in several ways. The careless use of a catheter may result in its breaking and leaving fragments of glass within the organ, or, if of silver, in leaving one of its disjointed segments. Women sometimes, from insanity or venereal excitement, introduce needles, pencils, pins, keys, fruit-seeds, etc.

The symptoms caused by foreign bodies in the urethra are the following: There is usually sharp abdominal pain, especially at the end of micturition. Sometimes, however, the foreign body is well tolerated, and the patients do not complain of its presence for several days, and then only ocasionally feel pain during the passage of the last drops of urine. At the end of a certain time, the foreign bodies become incrusted with phosphate of magnesia; and the walls of the bladder often become the seat of an inflammation, which may go on to ulceration and perforation, as the result of the irritation set up by the rarely aseptic substances. Vaginal touch, hypogastric palpation, and the use of the sound will determine the position and relations of the foreign body. Occasionally it is spontaneously expelled, but more often it causes retention of urine, hemorrhages of some severity, and even perforation of the vesico-vaginal wall. Given a certain size of the foreign body, the lesions may extend as far as the recto-vaginal wall.

Diagnosis is definitely established only when the substance has been found. It is well to begin with vaginal touch, which will sometimes suffice to reveal the presence and situation of the foreign body, but this should be followed by an examination of the canal, for which purpose Skene's endoscope will be of use. [An efficient vesical examination of the urethral canal and bladder can be made by the aid of a test tube large enough to admit the smallest post-nasal mirror, illumination being secured by light reflected from the concave head-mirror.]

Treatment consists of dilatation of the urethra to facilitate the spontaneous expulsion of the foreign body. When the latter is small, an aspirator may be used; if friable, it may be crushed; if hard and persistent, an attempt should be made to remove it in sections.

Foreign bodies placed transversely in the bladder, and which can be seized only in the centre, are of difficult extraction. Various ingenious instruments have been devised to change its position when it has once been grasped; it is well always to guide such instruments by means of a finger in the vagina. In some cases, a pointed probe curved at the end will be all that is necessary for extraction, after dilatation of the urethra.

5. TUMORS OF THE BLADDER.—Neoplasms of the bladder are of comparatively rare occurrence, met with in man chiefly between the ages of fifty and seventy years, in woman before the age of forty, and in young children in the first years of life. Their frequency is five times greater in man than in woman.

Pathological Anatomy.—Tumors of the bladder may be divided into two distinct classes: benign and malignant.

Pousson includes in the first class—

1. Papilloma, whether smooth or villous; 2, myxoma; 3, fibroma; 4, myoma.

In the second—

1. Epithelioma; 2, carcinoma (encephaloid, scirrhous, colloid); 3, sarcoma.

Cysts, enchondromata, etc., have been described, but are mere curiosities. Papillary, fibrous, myomatous, epithelioid, and encephaloid tumors are the only ones of interest.

The usual position of these tumors is the base of the bladder; the posterior wall is next in frequency; then the neck; and finally the anterior and lateral walls.

The pelvic and lumbar lymphatic ganglia are unaffected, because of the absence of lymphatics in the vesical wall. The tumors, therefore, do not extend, and the general health may remain in good condition for a long time. Usually the bladder contracts in size and those parts of the wall not invaded by the tumor become hypertrophied. If there be cystitis, it is not uncommon to find phosphatic concretions. The kidney shows the lesions of interstitial and pyelonephritis.

The most important symptom is hæmaturia, which is absent in only very exceptional cases. It comes apparently without cause,

which distinguishes it from the hemorrhage due to calculi. The patient notices the admixture of blood with the urine, especially in the morning; the discharge is usually abundant, and may be of sufficient duration to cause exhaustion; it may also disappear as suddenly as it came.

The urine does not usually undergo decomposition; should the quantity of blood be excessive, clots may form. At the beginning of micturition the urine is scarcely colored by the blood, but gradually becomes darkened as the diminution of intra-vesical pressure favors rupture of the poorly protected blood-vessels of the tumor.

When hæmaturia is not present, the urine is clear in the early stages of the disease; later, when cystitis is superadded, it is muddy and malodorous. Fragments of the tumor are occasionally passed and should be examined under the microscope, as they sometimes (though rarely, it is true) reveal the nature of the growth. Pain is not a constant symptom; the reason of its variability is not well understood. Thompson considers early pain a sign of malignancy, while Guyon believes that pain is caused only by contraction of the bladder, or when the neoplasm has invaded neighboring organs.

Physical Signs.—The tumor may project through the urethra, and may cause prolapse of the vesical mucosa, just as rectal polypi cause prolapse of the mucous lining of the rectum.

Abdominal palpation combined with vaginal examination will show the extent and consistence of the new growth, the condition of the walls, and the mobility of the pelvic organs. M. Bazy lays stress upon a sensation of ballottement obtained by slightly distending the bladder and placing one hand in the vagina, while with the other the abdominal walls are pressed down behind the symphysis.

The introduction of the catheter is to be resorted to only where absolutely necessary to clear the diagnosis, as it may cause fatal hemorrhage. If exploration be demanded, a solid and blunt-pointed metallic sound should be chosen. When a vegetation is met with, Guyon states that the sensation imparted to the hand is like that obtained from passing the instrument over a silky beard or a velvety surface. If necessary, the urethra may be dilated, and the vesical cavity explored by the finger.

The course of these tumors is slow, and, where they are benign, may last decades. Complications, such as cystitis, nephritis, pyelonephritis, may hasten the course.

The diagnosis consists of two parts: recognition of the tumor itself,

and of its nature. The character of the hæmaturia is the chief symptom to be depended upon in reaching a decision. Touch and palpation show the seat of the tumor, the condition of the vesical walls and of neighboring parts.

Treatment.—In most cases the intervention of surgery can render the patient's life endurable. At an advanced age, however, the rate of mortality from operation is increased. Operations are difficult and of questionable value when the vesical walls are the seat of much infiltration, when neighboring organs are affected, and when there are kidney lesions.

It will be readily granted that a pediculated tumor of the bladder does not require the same methods of treatment as a mass adherent to the surface of the organ by a wide base. Friable tumors also require different manœuvres for their removal than neoplasms composed of firm tissue. In most cases, the operation may be performed through the natural openings.

If a pediculated tumor project through the urethra, it may be drawn out with the forceps, and the pedicle seized by a wire écraseur or a serre-nœud; it may then be cut with a bistoury or a pair of scissors. To prevent hemorrhage, the pedicle may be ligated. If the neoplasm be within the bladder, the urethra is first to be dilated, and then digital exploration resorted to. If the tumor be soft and friable, the curette may be used, introduced carefully on a guiding finger in order to avoid contact with the healthy tissues. During the process, the cavity of the bladder should be washed out several times with a boric-acid solution, to rid it of clots and débris of the tumor. In case of a solid tumor, a thread may be thrown around the pedicle, and the effort made to draw it out. If this be impossible, several resources remain. Urethro-vaginal incision is one of them, laying open the whole urethral canal and a large part of the anterior vaginal wall. Simon advises a T-shaped incision, the vertical portion following the median line of the vesico-vaginal wall, stopping a little distance from the cervix, the transverse portion passing across the anterior end of the first incision, and extending about an inch and three-quarters on either side. This process would be of difficult application in cases where the whole internal surface of the bladder is covered by pediculated or sessile tumors; with this class of lesions, hypogastric incision is to be considered. The results of the operation are relatively good. Pousson estimates the mortality at 5.55% in women.

Some authorities, as a result of experimentation upon animals, have proposed resection of the bladder (Novaro, Vincent, Fischer, Gluck, etc.). Pousson and Bazy admit the benefit of partial resection in cases where one is sure of being able to remove the whole of the diseased zone.

5. URETERO-PYELITIS.—*Etiology.*—This variety of inflammation appears usually as the result of cystitis of long standing (gonorrhœal, calculous, etc.) or from the extension of pelvic inflammation (pelvic cellulitis, phlegmon of the broad ligament, etc.). The disease is ascending in all these cases. Descending uretero-pyelitis is consecutive to nephritis, especially to renal tuberculosis. Robin calls attention to a form of primary uretero-pyelitis from exposure to cold.

Pathological Anatomy.—In this affection we often find lesions of the urethra, and usually a cystitis of varying intensity. The openings of the ureters are apparently normal, but in some cases they are dilated; it is then easy to penetrate into the ureters, which have lost the obliquity of their intra-parietal portion. They are greatly dilated, interrupted here and there by valvular constrictions; sometimes they may be thickened with or without constrictions, but surrounded by the fibro-lipomatous tissues of peri-ureteritis (Hallé).

In the first of these types, the ureter may become as large in circumference as the small intestines, or even the colon. It is flexible and moniliform. A distinct feeling of fluctuation is felt upon palpation. The fluid passes from one bead-like dilatation to another and into the bladder. Upon section, the mucous lining of the ureters is seen to be thickened, smooth or downy, mottled with spots of congestion or ecchymosis. The second variety of lesion is characterized by peri-ureteritis. The fibro-lipomatous tissue surrounding the ureters adheres so closely to them that the utmost patience is required to dissect them out from the indurated mass. The ureter is found to be thickened and narrowed by annular cicatricial bands; they may be found at any portion of the duct, and are often unilateral.

The kidneys are dilated and nodular. Upon section through their convex border, a series of cavities is found, formed by the pelves and calyces. The central cavity is formed by the pelvis, into which the calyces open by round openings; they are separated from each other by septa which may be entire or reduced to mere bands of tissue. The renal tissue atrophies. From a histological point of view, the kidney lesions in uretero-pyelitis are the same as in diffuse interstitial nephritis, but the sclerosis varies in degree. The capsule may

also be the seat of serious lesions. In peri-uteritis, adhesive perinephritis is also found.

The symptoms are oftentimes of an insidious character; uretero-pyelitis may set in, and its existence be unsuspected until at an advanced stage of the disease. In another but rare class of cases, there are chills, fever, and pain in the region of the kidney. The earliest and most important symptoms are pyuria and polyuria. The discharge of pus is by no means constant, but, on the contrary, very variable: with cessation of pyuria, the pain and fever increase; upon its return, the general condition improves. The urine clearly shows these alternations of comfort and discomfort. The deposit found may weigh as much as eight and a half ounces. Sometimes the pus is of a greenish-white color, and odorless; again it is viscid and gelatinous, and possesses a fetid odor. The urine remains acid for a long while, but, as the disease advances, becomes alkaline from ammoniacal fermentation.

Polyuria is marked in uretero-pyelitis at the onset and at the crisis. The patient may pass from two to four quarts in the twenty-four hours. Toward the end of the disease the amount may be diminished to a pint a day. The specific gravity of the urine diminishes with polyuria.

Pain may be absent, but there may be sensitiveness to pressure over the lumbar region, which is increased by the use of the catheter or by prolonged exploration.

Palpation will sometimes reveal a well-marked tumor; its size will differ according as the examination is made before or after a discharge of pus. Palpation of the ureters is more difficult. They may be felt as a long, deeply seated cord in continuation with the renal tumor, a cord which is often nodular and knotty and which loses itself in the superior strait. Vaginal and rectal touch will also assist in determining the course of the ureter and the consistence of its walls.

The general health of the patient often remains unaffected for a long while; later it becomes impaired, the face is pale, yellow, and shrivelled; appetite is lessened and then disappears, the tongue is coated, feverish attacks and finally cachexia supervene.

The course of uretero-pyelitis depends upon the cause, upon whether the disease is limited to one side, and upon the formation of constrictions in the ureters. If a young and healthy subject be attacked with the disease, and the vesical affection be slight, the pyelitis may disappear upon treatment. Should the disease, however, be

of long standing, marked pyuria may suddenly appear. Should the disease become double, septic and uræmic accidents rapidly cause death. The pus may be evacuated into the cellular tissue surrounding the kidney, with the result of the formation of secondary peri-nephritic abscess which opens spontaneously into neighboring organs (colon, small intestine, stomach, etc.), or may be evacuated by means of incision in the lumbar region.

The diagnosis is somewhat difficult, especially at the onset; the disease may easily be mistaken for purulent cystitis. Abundant pyuria, a tumor and pain in the lumbar region, will enable us to decide as to its nature. Malignant tumors of the kidney are characterized by intense, persistent pain, hæmaturia, and rapid cachexia. Hydatids are rare; their diagnosis can only be established by the presence of hooklets or shreds of vesicles in the urine. Tuberculosis of the kidney rarely causes the formation of a tumor, the pus is always *mal lié*, and the existence of tubercular lesions elsewhere will usually lead to a suspicion of the nature of the renal affection.

Treatment should first be prophylactic. Cystitis, the cause of the urinary stasis, is to be treated. Milk should be prescribed, and the diet and mode of life regulated; counter-irritants may be applied to the lumbar region. If we find puffiness in this part, an incision should be made, followed by drainage of the cavity.

Nephrotomy permits exploration of the kidney, destruction of adhesions, removal of primary or secondary calculi. It is of especial value when the other kidney is also affected, and is often followed by speedy improvement in its condition. The accusation has been made that simple incision may leave a fistulous tract; Guyon, however, considers these fistulæ useful as safety-valves, permitting not only easy evacuation of the pus, but the direct application of antiseptic curative agents. If the inflammation subside or disappear, the wound may be closed. But if nephrotomy has not given the desired result, and the parenchyma of the kidney is known to be destroyed, removal of the organ is justifiable.

6. URINARY SEMIOLOGY.—This subject deals directly with the disorders of micturition: Retention; incontinence; hæmaturia; pyuria.

We shall also add a few words in regard to the examination of urine for other pathological products which it may contain.

1. *Retention of Urine.*—This symptom may occur in the course of many diseases, and consists in the impossibility of passing the whole or a part of the urine.

Retention may be complete or incomplete. Incomplete retention is manifested by frequent micturition, especially at night. The patients pass the urine slowly at first, and the last drops come only as the result of straining. (Tumors, constriction of the urethra, cystitis, etc.) An ovoid tumor is found extending above the symphysis and pressure upon it causes the desire to evacuate the bladder. The introduction of the catheter will demonstrate the existence of a large amount of urine. The course of retention depends entirely upon the cause. Prognosis depends upon the gravity of the disease to which it is due.

Complete retention usually occurs suddenly, and is the form observed after obstetrical interference (forceps, embryotomy, version). The patients are unable to completely void the bladder; periods of calm at first intervene between the attacks of desire for micturition, but the latter become constantly more frequent, and then pains supervene, radiating through the genital and hypogastric regions.

Given either complete or incomplete retention of urine, the prognosis and treatment must be withheld until the cause is ascertained. The condition may be due to—

1. Deficiency of expulsive power (paralysis of abdominal muscles or of the diaphragm).

2. Abdominal pain, if acute, causes the patient to abstain from all efforts which might cause pressure of the abdominal viscera (pelvic peritonitis, metritis, strangulated hernia, etc.).

3. Vesical Hernia.—The bladder has been known to protrude through a small opening (inguinal or crural canal, etc.). When it contracts, some of the urine will be evacuated through the urethra, but a certain amount will pass into the hernial sac. Its retention there will not fail to cause irritation, which may at first be superficial, but lead to deeper and even fatal lesions (calculi, perforations, etc.).

4. Descent of the uterus may cause compression of the urethra and neck of the bladder. The bladder may at the same time descend so as to be out of reach of the action of the abdominal muscles and the diaphragm, which can be of no further aid in micturition.

5. Affections of the nervous system (meningitis, diffuse encephalitis, softening, cerebral hemorrhage, tubercles, cerebral gliomata, locomotor ataxia, fevers of a severe type, asphyxia from carbonic-acid gas, etc., hysteria, vesania).

6. Obstacles to the Flow of Urine.—*a.* Situated without the ex-

cretory canal: Anterior and posterior displacements of the uterus; pregnancy; compression by the fœtal head.—*b.* Within the substance of the walls: Tumors of the urethra; tumors of the bladder projecting into the urethra; constrictions; atresia; spasm of the neck of the bladder.

Treatment should be adapted to the cause. If retention has already lasted several hours, and is causing pain, the bladder should be emptied at once. When it is the result of cerebral or spinal disease, the catheter is the chief resource. In a patient suffering from cystitis, the catheter is not to be introduced until the patient is put into a bath. If the use of the catheter be impossible, hypogastric puncture of the bladder should be resorted to. An aspirator (Potain's or Dieulafoy's) should be used, rendered thoroughly aseptic, and entered in the median line about a finger's breadth above the pubis.

Incontinence of Urine.—This means simply the involuntary and unconscious passing of urine, but is a symptom which in some cases constitutes in itself a veritable disease. Generally speaking, it occurs in one of three forms:

1. The bladder is full, but the urine flows continuously, drop by drop. This is incontinence from overflow. Any obstacle to the free egress of the urine may cause this variety (uterine prolapse, retrodisplacement, tumors of the urethra, etc.).

Urine is continually dropping from the ureters into the bladder, which distends as much as it can, and then causes the desire for evacuation. If the patient is unable to respond, the distention soon reaches its limits, and the urine presses upon the sphincter, which, after some resistance, is obliged to yield. The neck opens slightly, and allows the overflow to escape drop by drop. The escape of urine becomes involuntary and unconscious, occurring by day as well as by night.

2. The bladder is empty, and the urine passes out almost immediately after its entrance; this is true incontinence from deficiency of the sphincter. This is a rare variety. The bladder is completely empty, the neck is unable to entirely close, and an opening is left through which there is a constant dribbling.

The causes of this condition are many: (1) Fragments of calculi, polypi, cancer of the bladder drop into the neck and keep it mechanically distended. (2) Ulceration of tubercular or cancerous origin may destroy a part or the whole of the sphincter, and thus allow the continuous flow of urine.

3. The third variety is that observed in young children, and is usually designated under the name of nocturnal incontinence of urine. During the day micturition is normal, but at night the children are unconscious of the desire to pass urine, and it flows without their knowing it.

The treatment of incontinence must vary with the cause. The first variety, if due to uterine displacement, must be treated by curing the exciting condition. The second variety can only be cured by reaching the cause. The third variety is without the domain of a work on gynæcology.

Hæmaturia.—The emission of blood from the bladder in small or large amount, alone or mixed with other fluids, constitutes hæmaturia.

Symptoms.—The urine may be slightly tinged with blood, or the blood may escape drop by drop continuously or intermittently. Its discharge is preceded by the desire to urinate, and may be of frequent occurrence.

The amount is subject to considerable variation, and may be small or very large; when clots are discharged, they vary in shape and color, according to their source. Those formed in the bladder are large; those from the ureter are small, tubular, grooved upon their surface from the passage of the urine; those from the pelvis or calyces of the kidney often have the shape of those parts. Whatever their origin, they undergo a change in appearance, color, and even consistency if they remain long within the urinary tract. They become pale, friable, and often break up into fragments. Occasionally a large clot is discharged from the urethra, occasioning acute suffering; or it may block up the neck and urethra, causing partial or complete retention of urine.

We have given a rapid survey of the chief symptoms accompanying hæmaturia. There are many others, but their enumeration would necessitate a repetition of what has already been given under the head of Vesical Tuberculosis, Tumors, Cystitis, etc. The same may be said of the course, duration, and termination of hæmaturia.

The important points for the clinician are, the reasons for the hemorrhage—a knowledge of the primary disease.

The diagnosis of hæmaturia may be made by answering three questions: 1. Is the red coloration of the urine really due to the presence of blood? 2. If so, from what part of the urinary tract does it originate? 3. What disease causes this loss of blood?

1. Is it really blood?

The mere presence of a dark red coloration of the urine is not decisive. Other signs are more important. Urine containing blood is rapidly decomposed, and becomes alkaline. If allowed to stand, a deposit forms which resembles a clot; boiling gives the same result. Microscopic examination will show red corpuscles suspended in the fluid or contained within the clots.

Hæmoglobinuria is more difficult of detection. The spectroscope will show dark bands in the yellow-green portion of the spectrum. Moreover, all the rays starting from the blue and indigo are obscured.

2 and 3. What is the source of the blood, and the cause of the hemorrhage?

Urine may contain menstrual or lochial blood. To clear the diagnosis, the genitals should be carefully washed, and the urine then withdrawn with a catheter.

Generally speaking, it may be said that if the blood makes its appearance during the first part of micturition, or flows continuously, the hemorrhage is from the urethra; the blood is unmixed with urine, and its appearance is not preceded by a desire for evacuation or efforts at urination. This may also occur when a large amount of blood is in the bladder, and is therefore not an absolutely diagnostic sign. If by the action of some obstacle to a free emission of urine (tumor or constriction) the blood from the urethra flows backward into the bladder, its origin may be suspected but not positively affirmed.

When blood is discharged at the end of micturition, it is usually caused by cystitis. We have already spoken of the character of the urine in inflammatory affections of the bladder; the blood is generally mixed with pus. Gonorrhœal, tubercular, and calculous cystitis are the varieties which usually give rise to hemorrhage, which is more abundant in the first than in the others. The discharge of blood from neoplasms and calculi may be so large as to be of serious moment.

Treatment should be based upon the diagnosis, it being self-evident that the hemorrhage from neoplasms requires different treatment from that due to calculi, etc. Patients suffering from calculi should be ordered absolute quiet and the recumbent position in case of hemorrhage. Heat is not to be applied in the case of hemorrhage from tuberculosis or neoplasms. Tonics and anodynes should be administered (quinine, iron, chloral, opium, and morphine). Tannin

in doses of from three to nine grains is sometimes of great use. Dry cups may be applied to the lumbar region, the sides, or the hypogastrium. The rectum should be free, to prevent or remove pelvic congestion.

Clots may form in the bladder and cause retention of urine, in which case intra-vesical injections of some antiseptic solution (four-per-cent boric acid) or some astringent (two per cent of tannin) may be used, but with the utmost care. If the clots do not escape spontaneously, the effort must be made to break them up with a sound; failing in this, aspiration may be tried, and finally hypogastric or, better yet, vaginal incision.

Pyuria.—The urine, examined shortly after its evacuation, is cloudy in appearance, and separates into two distinct layers. The deposit at the bottom of the receptacle is greenish-white, sometimes yellowish or turgid with blood. The microscope and chemical reactions will reveal the presence of salts, pus, or semen. Urine derived from an inflamed bladder undergoes ammoniacal fermentation.

What is the origin of the pus?

If it appear suddenly, we must endeavor to ascertain whether there is inflammation in the pelvic cavity (phlegmon of the broad ligament, pelvic peritonitis, etc.). To determine whether the pus is discharged at the beginning, end, or during the course of micturition, the patient should be told to pass her urine into three different receptacles.

1. If pus be contained only in the first receptacle, it must come from the urethra or from the neighborhood of the neck of the bladder. In this case, leucocytes and the gonococcus will be found as well, and, if the inflammatory process be very acute, traces of desquamation of epithelium.

2. If pus is found only in the last receptacle, its source is the upper part of the urinary tract, or the bladder. Examination of the epithelial débris is useful; and a study of the symptoms will aid in determining the etiology.

Treatment is addressed to the cause.

Examination of Urine.—The normal amount of urine passed in twenty-four hours is about three pints. The reaction is acid, the specific gravity 1.015 to 1.030. It is of a reddish or amber tint, and possesses a characteristic odor and bitter, slightly saline taste. It contains water, chloride of sodium, sulphates, phosphates, urates, hippurates, urea, and extractives (creatin, creatinin, hypoxanthin, etc.).

Urea is eliminated at the rate of six to eight drachms in the twenty-four hours, the ratio being increased by an excessively albuminous diet and by fever, and decreased by a low diet. Urea is a white, crystalline body, with a cooling taste, soluble in water and alcohol. Its presence in the urine is shown by the addition of nitric acid, resulting in a precipitate of crystals of nitrate of urea.

Uric Acid.—Slightly soluble in water, it is found in urine in the form of urates, which are decomposed by hydrochloric acid, and characterized by a pink or red tinge.

Abnormal Constituents.—Blood will be recognized by microscopic and spectroscopic examinations. Urine containing blood becomes of a greenish tint upon the addition of liquor sodæ. This test is valueless if the patient have taken senna, rhubarb, or santonin. Biliary Substances.—These are found by placing urine in a glass receptacle, and slowly adding nitric acid, which is allowed to pour down the side of the glass so as to accumulate in the lower portion, where it forms a distinct layer. If bile be present, we shall see the formation of bluish-green, violet, and red layers above the nitric-acid zone. Iodine is found by the addition of a little starch, followed by a few drops of nitric acid. The blue iodide of starch is formed. Carbolic acid causes a gradual greenish-brown coloration upon exposure to the air. If the amount be too small for this reaction, perchloride of iron may be added, which will cause a violet tint to appear. Salicylic acid and antipyrine, however, give the same result with this reagent.

Albumin is found by the following tests: 1. Nitric acid, added drop by drop, gives a precipitate which does not disappear upon boiling. 2. Heat.—If the urine is neutral or alkaline, a few drops of acetic acid are added to restore the normal reaction; the urine is then slowly heated to the boiling-point.

Sugar is recognized by the use of the tartrate of copper and potassium solution (Fehling's). This should be tested before using, by diluting it with several times its volume of water, boiling for several minutes, and then allowing it to cool for several hours. If there be no trace of a deposit, the reagent may be considered reliable. Urine is to be put into the test-tube, with half its volume of the reagent, and heated until ebullition takes place in the lower part of the tube. The presence of sugar is shown by a reddish precipitate.

CHAPTER XXVIII.

DISEASES OF THE RECTUM AND PELVIS.*

Anatomy and Physiology.—The bony pelvis is formed posteriorly by the sacrum and coccyx, laterally and in front by the ilia.

The superior strait, marked posteriorly by the sacro-vertebral angle, and laterally by the linea innominata, is limited in front by the ileo-pectineal eminence, the horizontal ramus and upper border of the symphysis pubis; it separates the pelvis into two parts, the large or upper, and the small or inferior.

The large pelvis constitutes part of the inferior wall of the abdominal cavity and protects the intestines, the right iliac fossa being occupied by the cæcum and the left by the sigmoid flexure of the colon.

The small pelvis, closed in inferiorly by the muscular diaphragm of the pelvis, is transformed by it into the segment of a sphere, with its opening toward the abdominal cavity, and contains the internal genital organs (ovaries, tubes, uterus connected by the vagina with the external genitals), which are skirted posteriorly by the rectum, and anteriorly by the urinary tract (bladder and urethra).

The rectum, which is continuous with the sigmoid flexure, is relatively straight in comparison with it; whence the name, which is not absolutely correct. Commencing at the left sacro-iliac symphysis, it follows the concavity of the sacrum and passes to the median line of the body, crossing it at about the level of the third sacral segment, and going to the right portion of the pelvis; recrossing the median line, it inclines slightly to the left, and then again follows the median line down to the anus. Its antero-posterior curvature is like that of an S, whose upper concavity is parallel with that of the sacrum, and whose lower concavity faces the coccyx. There are likewise two transverse curvatures, the first looking to the left side, the second and smaller to the right.

The rectum is partially covered by peritoneum; its superior portion is completely invested by it, the two folds of the serous membrane meeting behind the intestinal canal to form the mesorectum, which does not bind the rectum so closely to the sacrum but that

* Auvard : Loc. cit.

there may possibly be displacement at this point. Lower down, the mesorectum disappears, the peritoneal covering limiting the colon only in front. Laterally, the rectum is bounded by cellular tissue. Below the cul-de-sac of Douglas, there is no peritoneal covering whatever, the rectum being in direct relation anteriorly to the vagina, posteriorly with the coccyx and the levator ani, laterally with the cellular tissue.

It is important to bear in mind the intimate relation of vagina and rectum, as a rectal examination may often give valuable information as regards the condition of vagina and uterus; and because during operation upon the posterior wall of the vagina there is always the danger of wounding this portion of the intestine.

As to its structure, the rectum, outside of the peritoneum which, as has been seen, forms but an incomplete covering, consists of a double layer of unstriped muscular tissue, the outer of which is composed of longitudinal fibres, of which some are reflected over the levator ani and are attached to the walls of the pelvis (sacrum and ilia), the rest being either lost in the fibres of the levator ani or in the integument about the anus. Below the longitudinal fibres is a second layer of circular fibres, which terminate at the anus by the formation of the internal sphincter, which is entirely separate from the external sphincter formed of striped muscular tissue.

Between the muscular coat and the mucosa is a layer of cellular tissue analogous to that of the rest of the intestine, and permitting a certain amount of mobility on the part of the mucous lining; this becomes pathological in cases of rectal prolapse.

The mucosa, which contains no papillæ, is covered with cylindrical epithelium, and is rich in tubular glands; at the junction of the inferior and middle third is Houston's valve, which can be reached by the examining finger.

The Anus.—This forms the termination of the digestive tract. Its description includes that of the orifice and the two sphincters surrounding it.

The anal orifice is in reality a canal, circular in shape, with its circumference puckered into folds. Normally, and when not subjected to strain, it is closed. A number of folds radiate from the circumference toward the centre, and may be seen by gentle traction upon the edges of the orifice. The mucous lining is rose-colored, and upon close examination is seen to be thrown into a few vertical folds, called the columns of the rectum. Between these are valvular folds,

comparable to the aortic valves, their free border being directed upward. These little pouches may be the starting-point of suppuration, due to the irritation caused by the temporary arrest of foreign bodies.

The external sphincter is found surrounding the orifice at a radius of about an inch. Its fixed attachment corresponds to the fibrous band which passes from the anal orifice to the tip of the coccyx, its movable point anteriorly to the superficial perineal fascia; its fibres blending with those of the constrictor vaginæ to form the figure of 8 muscle which surrounds vagina and anus.

The internal sphincter is formed by the inferior circular fibres of the rectum, arranged more compactly than in the superior portions. It is a trifle over an inch and a half in breadth, and is overlapped by the external sphincter which extends beyond it inferiorly.

Physiology.—When at rest, the sphincters keep the orifice closed, but any lesion of the spinal cord in its lower portion (dorsal vertebræ) will cause them to relax, and bring about incontinence of fæces.

Normally, defecation has its origin in a vague sensation of heaviness, caused by pressure of fecal matter upon the anus; this causes reflex contraction of the muscular coat of the rectum, tending to drive the accumulated matter toward the anus. If the sphincters offer any resistance, an antiperistaltic movement is initiated, pushing the fecal matter to the upper portion of the rectum. Should the mass of fæces, however, reach sufficiently high in the rectum, this opposition of the sphincters will be overcome, but straining is usually necessary to accomplish this result.

Wounds of the Rectum.—These may be due to traumatism or to surgical interference. Generally speaking, they are of rare occurrence, this portion of the intestine being deeply seated, and protected posteriorly by the sacrum.

The causes of these wounds are various. They may be produced by falling from a height upon a pointed body which reaches the anus and the rectum through the soft parts of the buttocks or perineum; or they may be due to the careless use of the sound, the tip of a syringe, etc. In some cases, perforation or, rather, rupture seems to occur spontaneously, as, for instance, during the expulsion of the fœtus. Straining at stool may also cause partial rupture of the recto-vaginal wall. It must not be forgotten that the prolonged sojourn of a metallic or hard-rubber pessary may cause a fissure and finally a wound of the septum.

The extent and depth of these wounds vary from slight and superficial lesions to those of considerable extent.

The symptoms are sufficiently marked to allow of diagnosis. Localized pain, a discharge of blood, and later of muco-pus first attract the attention of patient and physician. If, in addition, fecal matters are ejected through the vagina, or urine through the rectum, there is no room for doubt as to the nature of the affection. Hemorrhage may be alarming, inasmuch as it is difficult to check it: the loss of blood may be so excessive as to cause syncope. Peritonitis sometimes complicates wounds of the rectum. If the inflammation extend very gradually, it may be circumscribed and not prove serious; but if the instrument inflicting the injury first wound the peritoneum and draw it into bladder or rectum, the peritonitis induced is very acute in character, and the patient succumbs at the end of forty-eight or seventy-two hours. Peri-rectal phlegmon is a less serious complication, and usually ends in the formation of a fistula.

The older authors mention a condition which is surely rare—namely, emphysema—which following perforation of the rectum may reach alarming proportions. In a case reported in the *Lancet* of 1860 (Vol. 1, p. 89) it extended through the whole of the inferior portion of the abdomen.

Prognosis depends upon the situation, dimensions, and depth of the wound; as a rule, recovery ensues.

Treatment should be directed to the pain and any possible peritoneal complications; opium is the chief resource. Should suppuration occur in the peri-rectal tissue, free incisions should be made, followed by antiseptic irrigation.

The hemorrhage at the time of the accident may be so great as to necessitate rectal tamponade.

Foreign Bodies.—These belong to one of three classes, according to whether they (1) are introduced through the anus, (2) are ingested and reach the rectum after traversing the whole intestinal tract, (3) are formed in the rectum.

1. Foreign Bodies Introduced into the Anus.—Depraved habits and mental alienation play a part in the history of this condition. Badly fitting pessaries have been known to ulcerate through the recto-vaginal wall, and act as foreign bodies; sounds or other instruments used as therapeutic measures have also perforated the wall. The size and shape of the objects introduced into the rectum are of great variety, and the length has been known to reach twelve inches

and the breadth two and a half without causing serious consequences. Foreign bodies with a rough, unequal surface almost always cause erosions and scratches, sometimes even wounds and lacerations of some severity.

2. Foreign bodies reaching the rectum through the digestive tract constitute the most frequent variety. One remarkable case (Merlin's) is on record where a fish-bone, after penetrating through the rectal wall, traversed the uterine wall and entered the substance of the fœtus. We also find sets of teeth, coins, pins, etc., which have been swallowed.

3. Foreign bodies developed in the intestine or rectal ampulla. Masses of lumbricales are sometimes found in children. The most usual form, especially in the aged, in paralytics, and sometimes in hysterical patients, consists of masses of fecal matter; these are hardened and agglutinated, and may become covered with a whitish coating, and take on the characters of concretions or coproliths. In the centre of a compact mass, sometimes of voluminous size, we may often find a small nucleus, consisting of biliary calculi, cherry-pits, plum-stones, etc. The real cause of impaction is a diminution in the reflex power of the inferior portion of the intestine, and consequent inertia of the muscular fibres. In rectal constrictions and hemorrhoids it of course arises from a different cause. The presence of indurated fecal matters alters the shape and structure of the rectal wall; the rectum dilates above the seat of impaction, and finally ulcerative rectitis usually sets in.

The symptoms pointing to the accumulation of fæces are more or less those of the inflammatory process, pain, a sensation of weight in the perineum, serous, sanguinolent, and usually fetid diarrhœa.

These signs are of less importance than the constipation, which in the beginning is absolutely painless; later it imitates lumbar and crural pain, with a frequent and urgent desire to defecate. The efforts at relief are usually without result, yet sometimes by dint of excessive and painful straining, dry and almost petrified scybala are expelled.

The prolonged retention of fecal matter reacts disastrously upon the general health, in some cases even causing a veritable toxæmia. Digestive disturbances, hepatic pain, and nervous irritability sometimes drive the patients to the verge of despair. If, instead of scybala, a true foreign body cause irritation, the symptoms are all more pronounced, and surgical aid is usually called for within forty-eight hours.

The patients complain of sharp pain in the vicinity of the anus,

and a sense of weight in the rectum. Neighboring organs, as the bladder and uterus, are often involved, and inflammation soon sets in. If the foreign body have been introduced with great violence, the peritoneum may be injured. We can therefore readily see that more serious complications than simply lesions of the rectum, anus, and vagina may arise. A prolonged sojourn of the foreign body may cause inflammation, gangrene of the walls, peri-rectal inflammation (ischio-rectal fossa), pelvic cellulitis, hypogastric phlegmon, abortion, and intestinal obstruction.

In favorable cases, the foreign body becomes covered over by a layer of calcareous deposit, either remaining within the rectum or being expelled at the cost of pain and straining. The latter occurs only in case the substance be of small size.

Diagnosis is often difficult, especially in the absence of a history; a rectal examination should always be made when patients complain of obstinate constipation with pain in the rectum, perineum, and abdomen. In certain cases the introduction of the whole hand, according to Simon's method, will demonstrate the presence of a foreign body as high as the sigmoid flexure.

The prognosis is usually favorable, but may be serious if a foreign body introduced through the anus be breakable, rough, or sharp in character.

Treatment varies with the case; the surgeon will often have to exercise his ingenuity in devising appropriate methods of extraction of the offending substance. Forceps, hooks, the fingers, or hand may be used in turn; forcible dilatation may also be resorted to.

If the foreign body be out of reach, laparatomy may be necessitated; the intestine may be opened and afterward sutured, or the hand may be introduced into the abdominal opening and by pressure upon the intestine push the foreign body toward the anus.

Occasionally posterior rectotomy will accomplish the purpose.

RECTITIS.—Inflammation of the rectum is usually consecutive to that of the large intestine. It may, however, occur independently, in either the acute or chronic form.

The causes are many, and besides those already mentioned include inflamed hemorrhoids, mucous patches of the anus, and gonorrhœa, the use and abuse of drastic purgatives, obstinate constipation, the presence of foreign bodies (pins, fish-bones, biliary concretions, etc.), the oxyuris vermicularis, pæderasty, gonorrhœa, and the extension of inflammation from the anus.

The symptoms are at first limited to the lower portion of the digestive tract, but later painful phenomena extend to the sacrum, coccyx, bladder, and uterus. The anus becomes red, hot, and very sensitive, and contracture of the sphincter characterizes the onset. Constipation may persist for several days, followed by painful evacuations, tenesmus resulting in the expulsion of glairy mucus mixed with pus or blood. The mucous membrane is hot to the touch, red and downy; fever may be present. The second stage is characterized by profuse diarrhœa and a mucous or muco-purulent discharge. If neglected, the rectitis may pass on to the chronic stage, the symptoms being the same as those of the acute. Diarrhœa and constipation alternate.

Examination by means of the speculum will reveal the presence of numerous rounded superficial ulcers; sometimes, as in gonorrhœal rectitis, extensive vegetations. A thick greenish discharge causes redness, excoriations, and even eczematous eruptions of the perineum; the mucosa itself becomes thickened and sclerotic, and may cause constrictions of the rectum. Phlegmon, abscess, and fistulæ may further complicate the case.

The diagnosis of rectitis is not difficult, the disease being characterized by pain during defecation, and a rise of temperature, accompanied by tenesmus, and followed by a mucous discharge.

Dysentery differs by the frequency of the stools, hemorrhages, and the passage of shreds of membrane.

Treatment.—At the onset, opiated poultices to the abdomen, baths, and irrigation; later, injections of rhatany with a solution of tannin, and suppositories of iodoform.

PHLEGMON OF THE ANUS AND RECTUM.—These are divided into three classes: A. The first includes all superficial inflammations of the anus and rectum. B. The second, phlegmon of the ischio-rectal fossa. C. The third, those developed in the cellular tissue beneath the peritoneum and above the levator ani.

The etiological factors of these affections are many; the inflammation usually starts from some point of irritation, as scratches around the anus or deficient cleanlinesss. Gonorrhœal discharges from the rectum or vagina determine excoriations, as may the passage of hardened fæces, thus causing a superficial abscess at the margin of the anus. The etiology of abscess of the ischio-rectal fossa and the superior pelvi-rectal region is still a matter of dispute. Some authorities speak of them as idiopathic—a term which serves to conceal our

ignorance of the real cause. It is probable that many of these abscesses are due to tuberculosis which may develop locally. Others originate from ulceration of the inferior portion of the rectum, from rectitis, cancer, constrictions, inflamed internal hemorrhoids (phlebitis), the excision of condylomata, hemorrhoids, or other tumors. These affections all give rise to deep-seated abscesses, while those mentioned first occasion only the superficial variety.

A. *Superficial Inflammations.*—This includes superficial and phlegmonous abscesses.

1. Superficial abscesses give the following symptoms: There is usually a projecting tumor about the size of a walnut, slightly reddened and with hardened base. It is found to be superficial and strictly limited. At the end of a few days, during which it gives rise to pain of a more or less acute type, it softens, and fluctuation is felt; the skin becomes red and breaks, giving egress to pus. Tension being then relieved, the pain ceases, and a small spot of induration only is left.

The diagnosis of these abscesses is easy, if we bear in mind the foregoing signs.

As to the prognosis, the affection is not dangerous, and usually disappears rapidly. The same cannot be said of small abscesses developed at the expense of tubercular tissue; a small fistula usually persists, through which is discharged a serous or sero-purulent fluid.

Treatment consists in the application of poultices of starch sprinkled with laudanum, and in incision so soon as fluctuation is established.

2. Phlegmonous abscess, or phlegmon of the anus properly so called, is the form generally met with. Its usual seat is in the subcutaneous cellular tissue, but instead of being circumscribed it has a tendency to spread. At the end of a certain time, the patient is aware of a sensation of tension in the vicinity of the anus; later the increase in size is sufficiently marked to make the sitting posture and defecation exceedingly painful. Pressure over the tumefaction will presently yield the sensation of fluctuation, especially if a finger be introduced into the rectum, the other hand making pressure externally.

The development of these collections of pus has a direct bearing upon the history of fistulæ, as we shall see later.

The prognosis is serious.

Treatment consists of an extensive and deep incision, the bistoury

being carried in upon a grooved director in the direction of the rectum; the abscess sac to be washed out with a strong carbolic solution or a solution of chloride of zinc. If the phlegmon have partially opened into the rectum, the director may be entered through the opening and carried through the anus; the incision may then be made through all the tissues, including the anus.

B. *Phlegmon and Abscess of the Ischio-Rectal Fossa.*—The onset of this affection is usually insidious, but is soon made manifest by a large collection of pus in the perineal region, reaching from the anus to the ischium, and from the anterior portion of the perineum to the coccyx. The skin becomes hard and thickened under the influence of the inflammatory processes, and the pus burrowing into the deeper tissues destroys the cellular tissue and the aponeuroses, and spreads toward the labia majora, the rectum, and the tuberosities of the ischium.

As in all suppurations in the vicinity of the levator ani, the pus is extremely fetid. This muscle and the thickened skin preventing its further progress, it may destroy the external layers of the rectal wall, and accumulate just below the mucous membrane. In the case of burrowing abscess (abscès en bissac), the prolonged contact of the pus with the levator ani eventually destroys the muscle, and the suppuration invades the superior pelvi-rectal fossa.

Inflammation may extend to the ischio-rectal fossa of the other side, forming what is known as the circular or horse-shoe abscess; pressure upon either side will cause fluctuation in the other. In some cases the pus discharges externally.

The inflammation is accompanied by fever, the temperature often running very high, the pulse is rapid, there is excitement, and delirium or else collapse, terminating fatally within a few days.

Gangrenous phlegmon of the ischio-rectal fossa is not infrequent, and may usually be traced to the penetration of fecal matter or of urine into the cellular tissue, which becomes rapidly and extensively sphacelated. The skin darkens and becomes mottled with bluish spots and vesicles, then yields to the pressure beneath, and fetid pus mixed with gas is discharged. In some cases of especial severity the rectal wall also becomes gangrenous; prostration, delirium, a dry tongue, and a profuse and fetid diarrhœa are the symptoms, and the patient usually succumbs. A few cases have been known to recover.

The diagnosis presents little difficulty; rectal touch will be of

assistance in establishing it. The peri-rectal induration does not go beyond the levator ani.

Prognosis is serious, complications being liable to occur and cause rapid death.

Treatment should be prompt and energetic, and consist of a deep incision by means of the thermo-cautery, followed by irrigation with strong antiseptic solutions or cauterization with the chloride of zinc.

C. *Phlegmon and Abscess of the Superior Peri-Rectal Fossa.*—Having studied the inflammations of the cellular tissue situated below the levator ani, we will now describe the variety of phlegmon whose anatomical situation corresponds to the space filled with cellulo-adipose tissue bounded above by the pelvic peritoneum, and below by the aponeurosis covering the upper surface of the levator. The anatomical relations of the bladder, uterus, and rectum explain the existence of abscess of this superior pelvi-rectal space, some of them depending directly upon affections of the genital organs, and others upon ulcerations of the rectum and anus, or the inflammation of hemorrhoids. Caries of the anterior surface of the sacrum, and sometimes sacro-iliac arthritis may be the starting-point of pelvic suppurations.

The symptoms of suppuration in this region are unfortunately not well defined. The onset is insidious, the patients complaining of a sense of heaviness or even pain in the pelvis, which they are unable to localize. Constipation and painful defecation, malaise, and fever exist.

The course of the disease varies; usually the pus destroys or pushes aside the muscular fibres of the levator ani and spreads into the ischio-rectal fossa, where it forms a pocket (abscès en bissac), which later discharges externally. The fistulous tract thus formed is from three to six inches long. Or the pus may be discharged into the rectum, causing a symptomatic diarrhœa, which forms a sharp contrast to the earlier symptoms. Patients who complained of obstinate diarrhœa and painful stools are attacked by diarrhœa, fluid in its nature from the products of the inflammation of the cellular tissue, and followed by a copious discharge of pus. The opening is usually too small to allow of complete evacuation, and the phlegmon is very apt to become chronic in character. In some cases the pus burrows beneath the pelvic aponeurosis and is discharged into the vagina or bladder.

The diagnosis of this variety of abscess is difficult; rectal touch may be of some assistance.

Treatment consists in a large incision through the rectum to evacuate the pus.

HEMORRHOIDS.—By hemorrhoids we understand varicose dilatation of the veins of the anus.

Pathology.—Anatomy teaches us that the veins of this region are numerous and of a good size; that the superior hemorrhoidal veins empty into the inferior mesenteric, a branch of the portal; and that the inferior hemorrhoidal veins belong to the general venous system through the hypogastric.

Duret established the fact that the superior hemorrhoidal veins have their origin in some small ampulla-like dilatations near the anus, in the submucous cellular tissue. From this situation small transverse branches are given off to the internal and external sphincters, anastomosing in the vicinity of the latter with branches from the portal system and the inferior vena cava.

It can readily be seen that, since the greater part of the blood has to pass between the fibres of the sphincters, circulation is not very free in this region; when we consider, in addition, the effects of constipation, distention of the bladder, and the intermittent contractions of the sphincters and levator ani during defecation, it is easy to see why venous stasis sooner or later leads to dilatation or even rupture of the hemorrhoidal veins. Thus is explained the formation of the varicose dilatations which sometimes attain such enormous dimensions, and the frequent intermittent hemorrhages which occur. These dilatations are ampulla-like; they may become fused together, or complicated by additional ampullæ formed by dilatation of the capillaries. By the repeated breaking down of these vesicles, the ampullæ are converted into blood cysts. If the blood coagulates, the hemorrhoid becomes hard, sometimes even containing phleboliths, which by irritation of the adjacent connective tissue cause the production of more or less extensive sclerosis, and of small indurated tumors called *mariscæ* by the older authors.

Etiology.—Hemorrhoids are of frequent occurrence in men, and still more so in women; they are met with especially in those of a gouty or rheumatic diathesis, and are aggravated by an excessively nitrogenous diet, alcoholism, and sedentary habits.

Habitual constipation, the abuse of purgatives, and venereal excesses may be mentioned among the predisposing causes. Hemorrhoids may also be due to cirrhosis, mitral lesions, emphysema, some forms of ovarian cyst, tumors of the uterus or pelvic walls, etc.

Symptoms.—These vary, in some cases consisting of a sense of discomfort or weight; in others of pricking or sharp pains, or of an intolerable burning sensation, which prevents walking or the sitting posture—the patients lie upon their side or abdomen, afraid to move, and keeping all their muscles in a state of absolute rest. Constipation of course follows, causing headache, vertigo, and buzzing noises in the ear, the patients becoming pale and emaciated. These symptoms gradually increase in severity, until a veritable crisis is reached, after which the tension in the hemorrhoidal ampullæ decreases, the

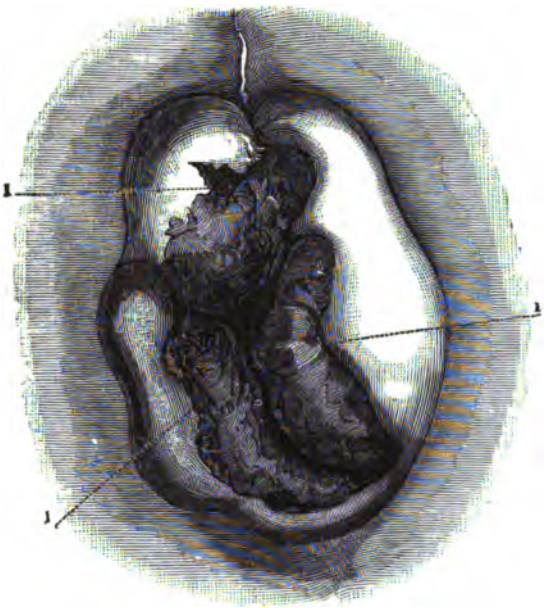

FIG. 169.—PROLAPSED INTERNAL HEMORRHOIDS SHOWING (AT 1) LINE OF JUNCTION OF THE SKIN AND MUCOUS MEMBRANE (CURLING).

pain disappears, and a stage of comparative comfort is reached. This is usually due to the rupture of the varices or to the erosion of the ano-rectal mucous membrane by the passage of a large hardened mass of fæces, determining a more or less abundant hemorrhage.

A local examination will show varying conditions according to the case. At times the hemorrhoid is a scarcely perceptible rounded or slightly elongated projection, more or less soft, and smooth, and containing no blood; this is the *disque* hemorrhoid; it may become tense, resistant, and painful. In some situations the skin and mucous membrane covering the hemorrhoid may become thickened, the small tumor becoming indurated, indolent, and taking on the appearance of

condyloma. Besides the external variety, we have internal hemorrhoids, which can be seen only by aid of the rectal speculum, under the form of small, soft, granular projections, often appreciated by touch alone. Under the influence of straining, these hemorrhoids project through the anus, which is then surrounded by a double row of varices, the external and the prolapsed internal hemorrhoids (Fig. 169). The latter can be replaced with more or less ease, some returning painlessly to place, others causing tenesmus. If spasmodic contraction of the sphincter interfere with the return of a prolapsed hemorrhoid, the latter becomes strangulated, causing an intolerable pain like that of contact with a red-hot iron. It is at first hard, tense, and of a purple color, which soon turns to brown or black, the change being due to interruption of the venous circulation caused by spasmodic contraction of the sphincter ani, and resulting in the formation of a slough. This is discharged at the end of a few days, and the functional disturbances cease. In some cases, however, inflammatory and suppurative processes induce erysipelas.

The *diagnosis* of hemorrhoids is not difficult; a little care will prevent confounding them with condylomata and polypi, which are hard and isolated tumors. Prolapsus of the rectum is characterized by a continuous and uniform excrescence rather than by irregular projections. Cancer of the rectum will be recognized by the ulcerating, fungoid tumor, the ichorus discharge, and abundant hemorrhages, and will not be readily mistaken for an ulcerating hemorrhoid. Before initiating treatment, it is well to ascertain the cause of the hemorrhoid, and to determine whether they are of the so-called idiopathic variety or due to disease of the liver or to an abdominal tumor.

Treatment.—The hygienic conditions of the patient should first be placed upon a satisfactory basis. Wines, liquor, and spices should be forbidden, constipation should be combated, without, however, resorting to drastic purgatives. Of surgical devices, the simplest consists in excision of the hemorrhoids by the aid of the thermo-cautery, placing a ligature or hæmostatic forceps upon the base of the small tumor. Partial excision is better than complete extirpation, which may cause contractions. In cases of small hemorrhoids, dilatation of the anus may suffice to cure spasm and pain. It should be done under chloroform, either by the aid of a speculum or simply by introducing the two thumbs into the anus and forcibly separating them.

VEGETATIONS.—These form a frequent complication of gonorrhœa, and appear as warty excrescences, something like cauliflower growths.

They do not differ in their etiology or pathology from vulvar tumors of the same nature.

Symptoms.—These growths, if situated near the anus, will cause sharp pain during defecation, and the fetid discharges to which they give rise often determine intertrigo and eczema of an exceedingly painful nature. Fatigue and over-exercise will cause hemorrhage and even sloughing.

The diagnosis is not difficult, except that they may be confounded with the moist papules of syphilis; the latter, however, will give rise to additional and characteristic symptoms; vegetations never attain so large a size as condylomata, but may otherwise resemble them.

Treatment is the same as for vegetations of the vulva.

CONDYLOMATA AND SYPHILITIC GROWTHS.—The character of a syphilitic eruption varies greatly according to its seat; in the vicinity of the ano-genital region it becomes prominent and tumefied and secretes a viscid fluid possessing a penetrating odor. In the early stages of a syphilide, it is a small dark red spot the size of a freckle. From the effect of friction and perspiration, the surface becomes grayish and diphtheritic and gradually ulcerates. In some cases, instead of molecular destruction, there is a formation of embryonal cells followed by that of connective tissue; the growth then becomes about the size of a bean, and has a lobulated surface.

Condylomata are usually found where two cutaneous surfaces are in contact, as the ischio-rectal fossæ and anal region. The symptoms vary from a feeling of irritation to sharp pain, especially during defecation; perspiration and other secretions cause intertrigo and erythema, and give rise to the formation of new moist papules.

The course depends largely upon the care given: where cleanliness is neglected, the papules encroach farther and farther, and finally form extensive ulcerations. Under suitable treatment, the secretion diminishes, the papules dry and atrophy, leaving a copper-colored spot or a small cicatrix.

POLYPI OF THE RECTUM.—These are benign tumors, characterized by a pedicle and insertion upon the mucous membrane.

Pathological Anatomy.—Rectal polypi are rarely multiple in the adult; they are usually small, but may attain to the size of a plum or even of a hen's egg, their variations in this respect being accounted for by the richness of their capillary system. They are round in shape, pediculated, with a smooth or granulated surface, somewhat hard in consistency, and of a reddish color. They are usually situ-

ated upon the posterior wall of the rectum, from an inch to an inch and a half above the anus, rarely higher, although they have been found two and even six inches above. The pedicle is cylindrical or flattened; broad and short in the case of fibrous polypi, long and slender in the case of mucous polypi. The constant friction caused by the passage of fecal matter has a tendency to lengthen the pedicle, which may become so slender as to break.

Structure.—A. Soft or Mucous Polypi.—These vascular polypi with loose connective-tissue stroma have been described by Allingham under the name of follicular mucous polypi, and by Gros as adenoid

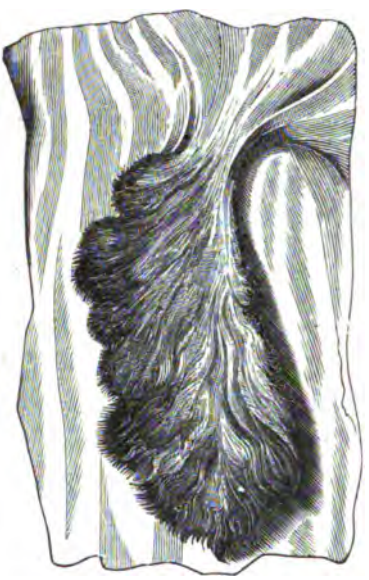

FIG. 170.—MUCOUS POLYP.

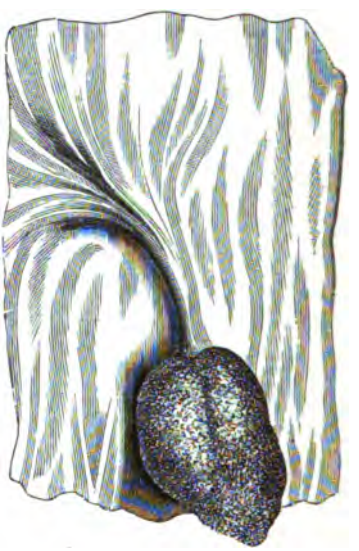

FIG. 171.—GLANDULAR POLYP.

polypi. More recent researches by Robin and Cornil have shown that they are due to a hypertrophy of glands possessing follicles or culs-de-sac. They are formed of cellular tissue, and covered by epithelium.

B. Hard or Fibrous Polypi.—These are harder and of a paler color than the preceding variety, the tissue squeaking under the knife. Malassez describes polypi formed in large part of unstriped muscle fibre, others have found elastic fibres. The surface is smooth; in a few rare cases, however, papillomatous or even villous. They are usually pediculated, and may be inserted upon the anterior wall of the rectum.

Symptoms.—These polypi may be present for a long time without being suspected; sometimes the patient is unaware of their existence until they protrude through the anus. In another class of cases, however, they cause a marked train of symptoms. Discomfort and pain are felt during defecation, and aggravated by a spasm of the sphincter, becoming lancinating in character and radiating throughout the pelvis. Discharges also occur of glairy mucus, of blood, or of mucus turgid with blood. The general health is usually unaffected, but frequent hemorrhages will produce anæmia, with vertigo and a tendency to syncope. Fissure, prolapsus, and even fistulæ oftentimes complicate rectal polypi. The course of the disease is slow. Some authorities claim that polypi disappear spontaneously. The pedicle may break, and the polypus be expelled.

Diagnosis is usually easy, and, if the polypus protrude from the anus, can be made simply by inspection. If the tumor be hidden, exploration of the rectum by the finger will be necessary. Chassaignac used to extract the polypus by the introduction of a small empty air-bag, which he then inflated and attempted to withdraw, the polypus being drawn down at the same time. With the tumor in sight, the differential diagnosis can readily be made. Hemorrhoids, it will be remembered, are ampulla-like dilatations surrounding the anus, and more or less turgid. In rectal prolapse, however extensive, a central orifice admitting the finger may always be found, and there is no trace of a pedicle. As to malignant tumors, they may always be recognized by the inguinal and lumbar adenitis, the fetid discharges, and the deterioration of the general health. The prognosis is favorable.

Treatment is of various kinds. Some operators seize the polypus, stretch the pedicle, and then twist it. Should the traction be too forcible, prolapse of the rectum might occur. Cauterization, and "écrasement linéaire" used to be in vogue, but are no longer used. The elastic ligature is still used, and when the pedicle is large a double thread is carried through it and each half tied off. The best and most rapid method consists in putting a silk ligature upon the pedicle, drawing out the polypus and excising it, leaving the ligature in place.

Rectal Prolapse.—The laxity of the cellular tissue between the mucous lining of the rectum and its muscular wall allows the mucosa to slip over the subjacent tissues and protrude from the anus. A very slight straining effort will bring the mucous membrane temporarily into sight; should this straining be extreme, not only the

mucosa, but sometimes all the coats of the intestine, will protrude, forming a tumor as deep as from one to three and a half inches.

If the tumor be small, a round opening is seen in the centre of its inferior extremity, and if large it may be drawn into horse-shoe shape by the traction of the meso-rectum.

The peritoneal cul-de-sac is usually dragged down, and a portion of the small intestine may even fall into the species of infundibulum formed. The ovary also may prolapse into it. Special circumstances are needed to bring about this condition of things, and not merely the natural tendency to glide possessed by the tissues. Diarrhœa and chronic dysentery, polypi or hemorrhoids, repeated pregnancies, tumors of the sacrum, and attacks of coughing in chronic bronchitis may cause the condition.

Symptoms.—Simple prolapse consists in the early stage in a slight eversion of the mucous membrane, which partially disappears when the straining efforts cease; later, it protrudes constantly, and becomes deeper and deeper, until it forms a cylindrical projection one and a half to two inches in depth. The surface is wrinkled, soft, pink, and shining; in the centre is the orifice with puckered margins leading to the intestines, while near the periphery the mucosa is continuous with the skin. This slight degree of prolapse may readily be reduced by pressure, but even at this stage the patients begin to experience discomfort upon walking. Later, the cylindrical tumor becomes lengthened, and the mucosa, losing its pinkish tinge, becomes congested, darkened, and painfully sensitive to touch. The mucus is gradually replaced by pus or a grayish glaze, which may hide a few superficial ulcerations. The mucosa loses its flexibility and sensitiveness, and takes on the character of integument, the transverse folds upon its surface gradually disappearing. The tumor may reach to the size of an orange, and is reduced with difficulty on account of the sclerotic and thickened condition of the submucous tissue. The stretched and dilated sphincters lose their tonicity and present no obstacle to the discharge of fecal matter.

Complete prolapsus may attain enormous dimensions. The tumor becomes globular, and is of a pink or red color, its external surface showing traces of the transverse folds when the mucosa adheres to the muscular coat beneath. At the inferior portion is found the orifice leading into the intestine; the base (upper portion) is surrounded by the anus. Some authors speak of a deep groove which separates the anus from the invaginated portion, but this groove is

not constant, and is found only when the inferior portion of the rectum has remained in place, the upper part prolapsing.

The portion of intestine forming the hernia swells and becomes the seat of an inflammatory process which may go on to the formation of a slough. Sometimes repeated hemorrhages threaten life; at other times peritonitis forms an alarming complication, or symptoms set in like those of intestinal strangulation.

The course of the prolapse is usually slow and progressive; if neglected or badly treated, the discomfort becomes great, so that walking or even sitting is painful.

Diagnosis presents no difficulty. Hemorrhoids are formed of small ampullæ, more or less independent, and separated by little grooves which in no wise resemble anything found upon the surface of a prolapsed rectum. Polypi are smooth tumors which are more or less indurated, and which are pediculated. Epithelioma will never be mistaken for prolapse, the latter being neither indurated nor of cauliflower appearance, nor giving rise to the ichorous discharge of malignant growths.

Prognosis varies according to the degree of the prolapse.

Treatment differs according to the gravity of the lesion, which is distinguished as reducible or strangulated and irreducible.

a. Reducible Prolapse.—The causes of the condition are to be sought for and removed. As a curative method, the thermo-cautery is available; three or four applications may be made to the projecting mucosa or to the point of juncture of the anus and skin. Bismuth and an opiate are then to be administered to cause constipation, which on the eighth or ninth day may be overcome by a purgative.

b. Irreducible Prolapse.—Many methods of treatment have been suggested, some purely palliative, as a sustaining bandage, others with the purpose of exciting the contractile power of the pelvic floor and whole rectal apparatus, as the administration of nux vomica, strychnine, and hypodermatic injections of ergotin.

Dupuytren, with the idea of causing cicatricial retraction of the anus, snipped off with the scissors from two to six of the pendulous flaps of skin surrounding the orifice. At a latter date, posterior recto-perineorrhaphy was performed, in order to produce plastic cicatrization of the orifice, Duret removing from the posterior wall of the rectum a triangular flap whose base included a portion of the sphincter, and Schwartz freshening a large surface on the anterior portion of the anus and rectum.

Mikulicz endeavors to shorten the rectum in the following manner:

The intestines are thoroughly washed out, and opium given to check peristalsis; the patient is then placed in the dorsal position and the operating field antiseptically prepared, after which the intestine is fixed and held by two loops of thread. The next step consists in incising transversely the anterior half of the external cylinder, layer by layer, from three to six-eighths of an inch from the margin of the anus. Sometimes, upon reaching the peritoneum, a hernia of the small intestines will be perceived and will have to be reduced (should the sphincter prevent the reduction, it may be cut) and the peritoneal folds united. The interior cylinder is then incised layer by layer, every vessel met with being tied, and the two are reunited by interrupted sutures carried through all the coats, the threads being left long enough to serve to steady the rectum during the remainder of the operation. The dissection and suture of the posterior half is next performed, all the threads cut short, and the wound powdered with iodoform.

Verneuil devised an operative procedure which he called *recto-pexie*, designed to supplement the supporting powers of the peritoneum and meso-rectum, and consisting of three steps.

1. Upon each side of the anus an incision is made about an inch and a half in length, obliquely from above downward and backward, the portion of the anal circumference included between the anterior extremities of these incisions corresponding to the portion to be contracted. They begin at the point of junction of the skin and mucous membrane; from their posterior extremities start two other small incisions which meet at the coccyx. The included flap is dissected from behind forward, the posterior fourth of the sphincter being removed at the same time, with care not to injure the rectal wall.

2. The second step consists in the insertion of four sutures of silkworm gut, introduced by means of a curved needle transversely into the posterior wall of the rectum, being careful not to injure the mucous membrane. When the threads are drawn toward the sacrum, it will be seen that the cavity of the rectum is made decidedly narrower, and the posterior wall immobilized to a great extent. To make this result permanent, a needle is introduced through the skin near the sacro-coccygeal articulation, about an inch from the median line, and brought out in the ano-coccygeal wound. The corresponding end

of the upper of the previously inserted threads is then passed through the needle's eye, and drawn to the exterior by withdrawing the needle, which is then reintroduced at a corresponding point on the opposite side and the other end secured. The other sutures are treated in the same way, and then tightly drawn and tied one after the other.

3. The third step in rectopexie consists in excision of the cutaneous flap, which had been dissected and left adhering by its base. A few additional sutures are inserted in the vicinity of and a trifle higher than the anus.

Rectopexie possesses many advantages, but can affect only a restricted portion of the rectum either in length or height.

M. Jeannel endeavored to reach the rectum higher up by what he calls "colpexie," which consists in making an artificial anus in the left iliac fossa, gently drawing and suturing the colon to the opening. He claims that by causing a cessation of the straining efforts accompanying defecation, and preventing retention of fæces, two frequent sources of rectal prolapse are obviated, and a permanent cure effected. Rectitis and ulcerations, if present, are given a chance to heal; and if necessary to contract a dilated anus, rectopexie could be performed during the interval of rest afforded by colpexie. The fixation of the colon in itself reduces the prolapse, and after a few months the artificial anus can be closed.

STRICTURE OF THE RECTUM.—Under this head it is usual to include the various diminutions in the calibre of the rectum caused by fibrous degeneration, not including any narrowing resulting from cancerous processes.

The method of production of fibrous strictures is as yet far from being thoroughly understood. While clearly established in the case of the stenoses produced by chronic dysentery, the influence of foreign bodies upon the mucous membrane, or as a result of surgical interference for hemorrhoids, epithelioma, or other tumors, it is still undetermined in the case of constrictions resulting from syphilitic affection. Gosselin in 1854 attempted to account for them by supposing the existence of plastic rectitis, or of a tumor due to the development of an anal chancre. Later, Desprès expressed the opinion that a phagedenic chancre was the cause of the constrictions, and Fournier that it was an ano-rectal syphiloma, each admitting that the early stages of the process were seldom seen.

Pathological Anatomy.—Syphilitic constrictions are cylindrical, and situated as a usual thing from two to two and a quarter inches

above the anus, although they may be found quite close to it. Some authors state that they reach as high as two and a half or three inches, which is not surprising when one considers the frequent large size of syphilitic ulcerations. Above the point of contraction there is usually a considerable dilatation due to accumulation and retention of fecal matters, which also produce so much irritation as to cause the extensive ulcerations with indented edges so well described by Gosselin and by Malassez. The inflammatory process may even lead on to abscess of the peri-rectal cellular tissue, with the formation of fistulous tracts from the rectum to the perineum or vagina. The tissues at this point are formed of new cells, and are vascular and easily torn; below they have the tough, inelastic character of cicatricial tissue. The muscular tissue of the rectal walls also participates in the inflammatory process, embryonal cells being often found in considerable number between the muscle fibres, sometimes even forming small abscesses.

Symptoms.—A certain condition of discomfort usually appears when the lesions are well established, the onset of the affection not being marked in any way. Later, straining efforts accompanied by the discharge of glairy matter streaked with blood awakens suspicion of the pathological condition. If the constriction be marked, symptoms of intestinal occlusion may make their appearance; the facies becomes drawn, the skin cadaverous, the abdomen swollen, the physician begins to consider the advisability of surgical interference, when a copious evacuation occurs of fetid fecal matters mixed with sloughing mucous membrane, pus, and sometimes blood, and the danger is over. All cases are not of this extreme type, as they vary from light to severe. Some authors hold that in rectal constriction the fecal mass is always flattened and tape-like, but this is not invariable. Small oval scybalæ are the most frequently met with.

The course of this affection is usually slow. It should be borne in mind that complications, such as phlegmon, abscess, fistula, intestinal occlusion or rupture, and peritonitis may at any moment change the course and prognosis of the disease.

The diagnosis of constrictions can be made only after careful exploration of the rectum. Hemorrhoids and polypi have nothing in common with constriction. Spasmodic contraction of the sphincter may lead to an error in diagnosis, but as it is not usually of long duration, repeated examination will rectify the mistake, or an anæsthetic may be of assistance. Pelvic tumors by pressure upon the

rectal walls diminish its calibre, but careful examination will show that the stenosis is only apparent.

Careful digital exploration will reveal the nature of the constriction, and the shape and seat of the tumor. Should a fungous, uneven, lumpy mass, bleeding readily upon touch, not sharply limited, and of rapid growth be found, it may very possibly be cancer of the rectum. But if the finger come in contact with a hard, inextensible, fibrous band, evidently situated in the rectal wall, and surmounted by a dilated and perhaps slightly ulcerated portion of intestine, the diagnosis of cicatricial retraction will probably be correct.

The *prognosis* is grave, as may be surmised from what has been said in regard to the course and symptoms of the disease.

The *treatment* depends upon the degree of contraction. In slightly marked cases, laxatives and enemata may suffice. In syphilitic cases, general treatment should be instituted and rigidly adhered to. Curative methods may be classed under four heads—dilatation, cauterization, incision, and extirpation. Cauterization is no longer used, and extirpation is reserved for cases of cancerous origin.

Dilatation may be gradual or rapid. The former method is well known and extensively used in spite of its relatively ancient origin. Graduated bougies and rubber canulæ are used; they must be carefully introduced into the rectum, whose anatomy should constantly be borne in mind.

The length of time that they are to be left in place in order to accomplish any good result is a matter upon which authorities differ. Some advise that they should be inserted in the evening, and remain all night and several hours of the following day. Trélat considered so prolonged a contact of the bougie with the mucous membrane injurious, and advised its introduction several times during the day, leaving it in place from one to two hours at a time.

The form and calibre of the bougies also vary. To reach constrictions seated high in the rectum, long, narrow sounds with an olive-shaped end have been used. Loss of tissue and ulceration form a contra-indication to the use of these instruments. The results are, moreover, not brilliant. If this be the case with gradual dilatation, much more is it true of rapid dilatation, which is not only uncertain in its effects, but dangerous, as liable to lead to extensive phlegmon of the peri-rectal cellular tissue, abscess, fistula, and even peritonitis.

When dilatation is of no avail, incision or rectotomy may be resorted to. Internal rectotomy, applied to the constriction alone and

leaving the sphincter untouched, has been abandoned, because of the danger of infiltration of fecal matter. Better results are obtained with external rectotomy, in which both the constricted portion and the sphincter are divided with a bistoury from before backward. Verneuil recommends the Chassaignac écraseur instead of a bistoury, the chain loop being passed into the rectum and behind the constriction and the sphincter.

CANCER OF THE RECTUM.—*Pathological Anatomy.*—The usual seat of rectal cancer, especially if it be primary, is in the inferior portion. It may, however, develop in the middle or the upper portion, and, when of secondary development from a uterine lesion, is found about four inches above the anus. It may be upon the lateral wall only, or be annular in shape, or again it may occur in the form of scattered nodules. The recto-vaginal wall is often invaded, and even perforated at an advanced stage of the disease, and the cervix uteri rarely escapes infection. Invasion of the perineum and external genitals is far more rare.

Cancer may occur in the form of a vegetative growth, a tumor, an ulcer, or a retraction of tissue.

Vegetations are of the cauliflower variety, soft, and easily bleeding; when in sufficient numbers and closely aggregated, they form veritable tumors.

Ulceration is frequently met with, especially when the anal region is the seat of the disease. The base is infiltrated and not well defined. Vegetative growths may often be seen upon the borders of the ulceration.

The development of cancer leads inevitably to retraction, which may even go so far as to almost obliterate the lumen of the anus. Complications analogous to those caused by cicatricial contraction may of course occur, phlegmon, abscess, and fistula being perhaps even more frequent.

Histologically, two varieties of epithelioma are recognized: Lobulated epithelioma is usually situated at the anal orifice, and appears first as a small hard spot, which gradually attains the size of a large pigeon's egg. Under the microscope it is seen to be composed of a mass of pavement cells, in the midst of which may be seen a few of the spherical epidermic nests characteristic of the lesion. Cylindrical-celled epithelioma has been described, which is characterized by the adenoid arrangement of the cells. These are, however, not the only cancerous growths of the rectum, the scirrhous and colloid

variety having also been described. Scirrhous cancer has the appearance of cicatricial tissue. Beginning in the submucous connective tissue, long fibrous bands are seen extending toward the surface and enclosing the large cells characteristic of carcinoma. Colloid cancer is also of frequent occurrence. Ulceration taking place early causes a loss of substance, which at first increases the calibre of the rectum. In the discharges may be found shreds of mucous membrane, which under the microscope are seen to be formed of globular masses surrounded by concentric layers.

The *symptoms* are insidious at the onset; nevertheless it is easy to see that the patient's general condition is affected. There are ill-defined disorders of digestion, such as a certain slowness of the digestive function, a repugnance for certain articles of food, especially meat, or constipation alternating with diarrhœa. The stools may be like soot or coffee grounds. If a rectal examination be omitted, one might at first be led to suspect cancer of the stomach, but soon symptoms appear referable to the lower portion of the digestive tract, such as a sense of weight and discomfort, spasmodic contractions, straining, tenesmus. Defecation becomes painful, and may be accompanied by a loss of blood and glairy mucus. As the disease advances, the various symptoms described under the head of Stricture of the Rectum appear; constipation lasting days or even weeks alternates with profuse and exhausting diarrhœa. This constipation may cause profound general disturbance, as stercoræmic, toxæmia; add to this the effects produced by the absorption of the destroyed neoplastic tissue, and the gravity of the condition will be apparent. The ever-present danger of intestinal occlusion, the continuous burning pain radiating through the pelvis, and the impossibility of taking the sitting posture or of getting any rest, soon render life intolerable. Rectal touch and palpation of the inguinal and lumbar glands are indispensable. The finger recognizes the lateral or annular position of the growth, the cauliflower vegetations, or flat indurations already mentioned under the head of pathological anatomy. Upon withdrawing the finger, the surgeon will be impressed with the extremely fetid odor of the discharge, and will perceive blood and epithelial débris.

What will be the course of cancer of the rectum? That will depend upon the nature of the growth, the age and condition of the patient, and most of all upon the presence or absence of complications. If there be extension toward the perineum and external geni-

tal organs, the patient will rarely live longer than a year. Phlegmon, stercoraceous abscess, purulent cystitis, and peritonitis cause a speedy and fatal issue in a patient already weakened beyond the point of resistance by hemorrhages, pain, and the absorption of septic materials.

The *diagnosis* of cancer of the rectum is rarely attended by any difficulty. The index finger should be introduced as deeply as possible into the rectum, and the endeavor made to ascertain the form, extent, and variety of the growth. The vulva, vagina, culs-de-sac, and cervix should also be subjected to close scrutiny.

As to the differential diagnosis, it is well to bear in mind the various errors to which tumors developed at or near the anus have given rise.

Polypi are sharply limited, smooth, pediculated tumors growing upon a normal mucous membrane. Fibrous cicatricial constrictions are regular, more circumscribed, more sharply limited, and never present the large vegetations so frequent in carcinoma. Nevertheless it must be acknowledged that it is often extremely difficult to distinguish scirrhous cancer from fibrous constrictions, the course of the disease only deciding the diagnosis. Hemorrhoids will rarely be a source of error. They are small ampullar tumors, smooth, round, and sharply limited, and even when they are the seat of ulcerations the latter are so small as to be mere excoriations. As to condylomata, they are so hard, so little friable, and have so furrowed a surface that they cannot easily be mistaken for epithelioma. The general condition also will prevent such an error.

Prognosis is always grave, and even radical operations can only bring about a temporary cure.

Treatment will vary according to the condition. If the disease progress rapidly, the general health be poor, and there be signs of extension of the cancer, surgical interference will be useless. The only indications will be to quiet the pain by suppositories or injections of morphine, and to combat constipation by laxatives. An easily assimilated diet will be prescribed, especially milk, boiled fish, the lighter meats, etc., prohibiting anything which might irritate the intestines.

Dilatation by means of bougies is not to be recommended.

Rectotomy consists in making an incision in the median line posteriorly, to include all the soft parts from the anus to the coccyx, and is done with the view of facilitating the evacuation of fecal matter and preventing obstruction. It is but rarely indicated.

The creation of an artificial anus is useful in diverting the fecal matter from the diseased rectal walls, and in averting the danger of intestinal obstruction. The opening may be made near the sigmoid flexure or even the descending colon. This method of treatment is especially indicated where the cancer is extensively spread out and has already invaded a large portion of the intestines. When, on the other hand, the epithelioma is limited to the immediate neighborhood of the anus or the inferior portion of the rectum, the best operation will be extirpation. Thanks to our present methods of hæmostasis, the bistoury may be freely used without danger. The thermo-cautery, preferred by some surgeons, has the disadvantage of causing by radiation an extensive destruction of tissue, whose subsequent suppuration and elimination greatly retard recovery. The simplest procedure consists in making two elliptical incisions which meet anteriorly and posteriorly, then dissecting out the included portion of rectal wall, and having brought it down in excising the diseased surfaces, suturing the newly made end of the rectum to the integument.

Fissures Around the Anus.—By these we mean small, superficial excoriations situated between the radiating folds of the anus, which cause sharp pain and spasmodic contraction of the sphincters.

Etiology.—Habitual constipation seems to play an important part in the production of fissures, the hardened fæces being unable to pass the anus without causing erosions or lacerations of the mucous membrane. Sometimes coexisting hemorrhoids, eczema, and erythema are found which quite possibly have been the cause of reflex contraction of the sphincters, and the constipation which has occasioned the fissures. Some authorities refer to a congenital narrowing of the anus.

Symptoms.—Oftentimes fissures, called by Gosselin tolerated fissures, are not known to exist until discovered during examination. Again, they may cause exceedingly sharp pain which reaches its maximum during defecation; a period of relative calm may follow, but in twenty or twenty-five minutes the acute, lancinating pains reappear, with a sensation of tension, pricking, and burning at the anus, radiating to the groins, thigh, and lumbar region. The painful crisis may last six, eight, or even ten hours. The patients sometimes lie immovable, afraid to make the slightest change of position; at other times they assume strange postures in the effort to cause pressure upon the anus. Those most careful of themselves take enemata

and cold sitz-baths which are found to be soothing in effect, while others are in such terror of provoking a movement that they neglect going to stool, and cause obstinate constipation. This reacts disastrously upon the general condition, bringing on gastralgia and impairment of the digestive functions, stercoræmia, and a wasting away of the body not far removed from cachexia. In some cases this critical condition is further complicated by colic, vesical spasm, crural and sciatic neuralgia.

Diagnosis.—Simple inspection of the anal region is often sufficient to determine the existence of fissures, but in many cases the diagnosis cannot be so easily made, and other means will have to be resorted to. Sometimes by digital examination the seat of pain may be discovered, or a straining effort on the part of the patient will bring the rectal mucosa into view, and the small ulceration will be revealed.

Fissures are single or multiple, and appear like small cracks with a pink tinge; their edges may be scarcely perceptible, or they may be hard and of a dirty gray color. If the fissure have already existed some time, small vegetations may develop in their vicinity, and may even hide them from sight and lead to an error in diagnosis. These little fissures, which are a mere solution of continuity, are not easily confounded with hemorrhoids or vegetations. Idiopathic neuralgia of the anus is the only condition which might cause difficulty in the diagnosis, but this affection comes on spontaneously and is not connected with defecation.

Prognosis.—The disease is benign in its nature, but, if neglected, may occasion serious troubles.

Treatment.—Palliative: baths and opiated enemata. Curative: gradual dilatation with bougies, or, better, forced dilatation by means of the two thumbs introduced into the anus.

Fistula in Ano.—A fistula is a narrow canal between two neighboring parts which are normally separate.

Fistulæ are said to be complete when they open upon the surface of the skin as well as upon the surface of the mucosa (Fig. 172, B); incomplete, blind external (Fig. 172, D) when they open upon the surface of the skin only; and incomplete, blind internal (Fig. 172, C) when they open upon the mucous surface alone.

From a pathogenic point of view they may be classified as follows: 1. Fistulæ consecutive to inflammation of the cellular tissue of the pelvi-rectal fossæ—common fistulæ or inferior pelvi-rectal fistulæ. 2. Fis-

tulæ due to a suppuration of the adipose layer of the superior pelvi-rectal space—superior pelvi-rectal fistulæ. 3. Fistulæ whose source is a lesion of the bone—osteopathic fistulæ. The first and second varieties are the only ones which here concern us.

1. *Inferior Pelvi-Rectal Fistulæ.*—These are the ones most frequently met with in daily practice. There are three subdivisions of the variety. If the fistulous tract be just beneath the integument, and do not involve the sphincters, it is called subcutaneous; if the fibres of the sphincters are perforated, we call it a deep or intra-muscular fistula; and if its course is above the sphincters, it is the supra-muscular fistula.

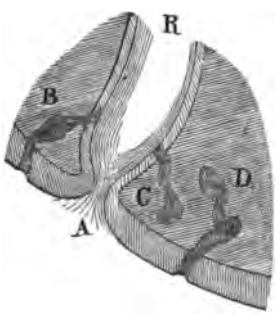

FIG. 172.—RECTAL FISTULÆ. *A*, Anus; *R*, Rectum; *B*, complete fistula; *C*, blind internal fistula; *D*, blind external fistula.

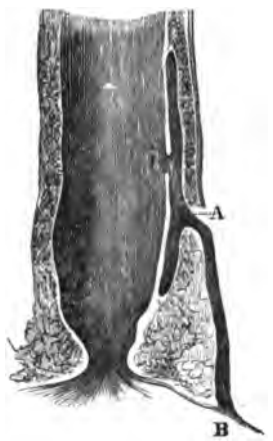

FIG. 173.—*A*, *B*, Deep submuscular track, resulting from an ischio-rectal abscess; *A*, *I*, submucous track running up and down the bowel.

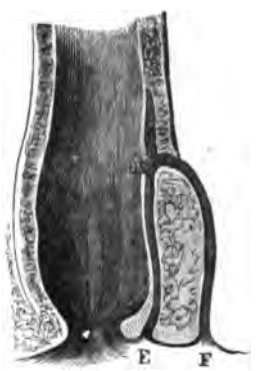

FIG. 174.—*D*, *E*, Subtegumentary and submucous fistula, with internal and external opening; *D*, *F*, deep submuscular track having same internal, but separate external opening.

A description of a fistula includes that of the external and internal orifice, and the canal between.

External Cutaneous Orifice.—This is usually single, and may be found on either side. In the subcutaneous variety, it is usually a few millimetres from the anus or in the midst of the radiating folds. In the case of deep fistulæ, it is some little distance from the anus. It may be seen as a narrow opening at the summit of a small red elevation, or may be hidden in the base of an ulceration. Sometimes upon the apex of an elevation are seen a number of openings, which may lead to one canal only or to a number of them.

Internal or Mucous Orifice.—This is often situated just above the point of juncture of skin and mucous membrane, but sometimes is

found from two to two and a half inches higher. It may be a simple opening upon the top of a minute elevation, or it may be large and have jagged edges. Frequently the probe enters the fistula and is felt to travel beneath the mucous membrane for some distance, and then to obliquely emerge upon the surface of the rectal mucosa.

The Fistulous Tract.—Sometimes straight and sometimes sinuous, the fistulous tract is directed from below upward, from without inward, from the cutaneous surface to the rectum. In the case of incomplete fistula, it stops midway. If several openings are found near the anus, exploration with the probe will often demonstrate the fact that they intercommunicate and finally merge into one canal which leads to the internal orifice. This semicircular arrangement of openings around the anus has been called a horse-shoe fistula. The tract is usually short, but may be of considerable length.

2. *Superior Pelvi-Rectal Fistulæ.*—These are due to inflammations of the cellular tissue between the levator ani and peritoneum, followed by abscess. The fistulous tract is usually straight and long (from three to six inches), these two characteristics rendering this variety easy of recognition. Moreover, its diagnosis from fistula of the inferior pelvi-rectal space is facilitated by noticing the distance between the finger introduced in the anus and the probe in the fistula.

Etiology, Pathogenesis.—Tuberculosis is the chief cause of fistula. Microscopical research has shown that tubercular deposits in the midst of the pelvi-rectal cellular tissue bring about degeneration, necrosis, and disappearance of the normal tissues, with the formation of pus which is discharged externally or into the rectum. Less frequently small foreign bodies lodged in the folds near the anus, or the rupture of a hemorrhoid with infection of the cellular tissue and consequent abscess formation may give rise to a fistula.

The reason of the slow closure and the defective cicatrization of fistulous tracts was for a long time not understood; until quite recently it was explained by the mobility of the rectum, the frequent contractions of the levator ani. At the present day we know that the nature of the affection producing the fistula is the cause of the slowness in cicatrization. The fistula will not close so long as there are tubercular granulations present in process of evolution.

Symptoms.—These are many and various. Some patients complain of pruritus, others are annoyed by the secretion of pus, which may be abundant, and which is nearly always malodorous. Ery-

thema or eczema sooner or later appears in the ischio-rectal fossæ. The external orifice sometimes becomes obliterated, in which case there is retention of pus, and turgescence of the tissues interfering greatly with the sitting posture.

An examination of the anal region will show either one small orifice, or a number of them resembling the rose of a watering-pot. In the case of blind internal fistulæ, the pus is discharged through the anus, but there is turgescence through the whole peri-anal region.

Diagnosis.—For an examination of the anus, it is advisable to put the patient in the lateral position, with one thigh extended and the other flexed; the upper buttock is then lifted up and the anal region explored. Some surgeons prefer the dorsal decubitus, with the lower limbs uplifted. While inspection is sufficient to reveal the existence of a fistula, its extent and nature can be shown only by a digital examination. With a probe introduced through the external orifice and a finger in the rectum, the condition of things can be well appreciated.

In the case of blind internal fistulæ the digital examination causes pain, and a small amount of pus is discharged; the finger meets no ulceration, fungoid growth, nor induration in the rectum, which permits the elimination of cancer, polypus, cicatricial constrictions, and syphilis; a certain feeling of induration around the anus will point to a probable blind internal fistula.

Prognosis is always somewhat grave, for, though the fistula itself may not be of an alarming nature, it reveals a bad general condition, favorable to the development of the tubercle bacillus.

Treatment.—Some surgeons still use the elastic ligature. A probe in which is an elastic thread is carried into the external orifice and out through the anus; the ligature is then tightly drawn and tied. By degrees the thread cuts through the tissues, cicatrization following in its wake, until it is eliminated. Oftentimes, after the thread has been discharged, the fistula still persists, because the diseased tissues have not been removed, and their morbid development continues. Incision followed by the thermo-cautery is more efficacious. A grooved director is introduced into the fistula, while a finger passed into the rectum feels for the end of the instrument. The soft parts are then cut through upon the director, the base of the tract cauterized with the thermo-cautery, iodoform powder is dusted over the wound, and the whole covered with iodoform gauze. The best method of all consists in incision of the fistulous tract with the bistoury, in scraping it

thoroughly with the curette, washing it with an antiseptic solution, and suturing the edges of the wound.

The general condition of the patient should at the same time be attended to, by the administration of cod-liver oil, creosote, phosphate of lime, iodide of potassium, or tonics.

PRURITUS ANI.—This may be intermittent or continuous; it may be so severe as to cause prolonged insomnia and constitute a state of absolute misery for the patient. To the physician its chief interest resides in the etiology upon which should be based the treatment. There are three etiological varieties of pruritus:

1. Parasitical. 2. Secondary. 3. Idiopathic.

1. The first is usually due to the Oxyuris vermicularis, an intestinal worm about a third of an inch long, and resembling a white thread. It is usually visible to the naked eye upon examining the anus; but it is best to make two or three successive explorations, in case the result is negative at first. The fecal matters should also be examined, for the parasite may hide itself within the folds of the anus and escape detection.

2. Secondary pruritus sometimes occurs as a symptom of hemorrhoids, erythema, eczema, herpes, or any other affection causing irritation of the anal region. Inspection at once reveals the cause of the trouble.

3. Finally, pruritus may exist without there being a trace of a parasite or of any pathological affection. It is then considered idiopathic, of the nature of neuralgia or dermalgia. This diagnosis is to be made only in the absence of any appreciable cause. (See also Pruritus vulvæ.)

Treatment depends upon the etiology. In the case of the oxyuris, the margin of the anus should be washed with a bichloride solution 1 to 1,000, and if necessary an enema may be given of equal parts of water and vinegar, or the following may be used:

Carbolic acid, ...	grs. iij.
Glycerin, ...	ʒ iiss.
Infusion of wormwood, ...	℥ iiiss.

In secondary pruritus, treat the original disease.

In the idiopathic variety the application of hot fomentations (122° F.) several times a day, an ointment of cocaine 1 to 10, the actual cautery applied in a circle from one and a half to two inches from the anal orifice, morphine suppositories, general sedatives, and even dila-

tation of the anus under chloroform, may all be resorted to in the hope of alleviating the condition.

DIAGNOSIS OF TUMORS OF THE INTERNAL SURFACE OF THE PELVIS.—In a study of the nature and situation of these tumors, it is absolutely necessary to know the family and personal history of the patient, the latter being of prime importance. Syphilis and pregnancy are known to have a marked effect upon the development of tumors in general and pelvic tumors in particular. The patient should also be closely questioned as to whether there have been violent traumatism, fractures, luxation, etc. If there be pain, its nature must be ascertained.

These points having been established, the usual methods of examination may be resorted to. By palpation we will ascertain the form, relations, mobility and consistence of the tumor, and the existence of pulsation and crepitation. Puncture might in certain cases throw light upon the nature of the neoplasm. Touch is, however, our chief reliance in ascertaining whether we have to do with a tumor of the pelvis or with an affection of one of the organs contained therein (uterus, rectum, bladder, etc.). If it be well established that the tumor is pelvic, digital touch will enable us to ascertain its position and consistence, and will give us other information in regard to its relations and probable consequences. Another less usual method of exploration is equally important. Neoplasms of the posterior surface of the pubis and ischio-pubic ramus may be complicated by a retention of urine or by dysuria. In these cases the use of the catheter may incidentally throw light upon the direction and calibre of the urethra.

If the tumor be hard, bony, and of equal consistency throughout, the question will be as to whether it is an exostosis or an enchondroma. These two varieties of tumor have some points in common. Both have a predilection for the ischio-pubic, the sacral, or the sacro-iliac region; they are of slow growth, very slightly painful, and cause pressure phenomena only when they are at an advanced stage of development. Exostosis is uniformly hard throughout; enchondroma, on the contrary, becomes covered with nodules more or less projecting, and more or less dense. Some remain hard, some become elastic, and some present fluctuation.

The diagnosis between a promontory projecting into a rachitic pelvis and an exostosis of the sacrum is often difficult; the history and the existence of other rachitic deformities will assist in solving

the problem. There is less difficulty in diagnosing a callus from an exostosis: in the latter case, the intrapelvic tumor is hard, uneven, adherent by its base to the anterior surface of the sacrum, and several depressions are found upon the external surface of the pelvis corresponding exactly to the internal projections; commemorative signs are of great value; as, for instance, if there have been serious traumatism (a heavy fall upon the nates, crushing by a carriage wheel, etc.), fracture and callus will be the probable diagnosis.

Fully developed enchondroma might suggest osteo-sarcoma. The special signs are as follows: Chondroma is usually found upon the pubic bone, the ischium, sacrum, or ilium, near the sacro-iliac articulation. Osteo-sarcoma, on the other hand, is usually situated near the cotyloid cavity. Enchondroma remains latent for a long time, and does not cause pressure symptoms until the later stages of its development. Osteo-sarcoma, from the very start, gives rise to pain of a persistent nature. Enchondromata are exceedingly irregular in outline, presenting nodules which are large or small, hard or fluctuating. Moreover, they often attain an enormous size (which is never the case with osteo-sarcomata), show no tendency to spread, and never give the sound of crepitation so distinctly perceived in the case of osteo-sarcoma. The latter is a neoplasm which has given rise to many a mistake in diagnosis; in the early stage, it is frequently mistaken for sciatic neuralgia, but here again the acuteness and persistence of the pain, and the inefficiency of all therapeutic measures should attract the notice of the surgeon.

Syphilitic exostoses may be suspected when the pain is nocturnal, but the failure of specific treatment to remedy the trouble should lead one to think of osteo-sarcoma. Aneurism is an occasional source of error, but it is a pulsating and easily depressed tumor from the start; some cases of long standing, however, do not possess these characteristics, the sac being filled with clots of blood.

Fibromata originate from the point of junction of the aponeuroses with the periosteum; they are frequently found in the iliac fossæ. Depaul met with one that was implanted at the juncture of the last two lumbar vertebræ on the left side, and in the sacral notch of the third sacral vertebra. Smith recalls a case where a fibrous tumor, which started from the periosteum of the pubic bone, insinuated itself beneath the pubic arch. Nicaise observed one situated on the inner side of the tuberosity of the ischium.

Hydatid cysts are rounded in form, circumscribed, and present

more or less fluctuation. They may be mistaken for chronic abscess, but the presence of a rough and friable bony rim indicating an alteration in the structure of the bone should clear the diagnosis. Exploratory puncture will be of little value, the fluid contents of a cyst usually undergoing marked alteration. These tumors are often found near the coxo-femoral articulation, rarely in the vicinity of the sacrum or pubis.

Sacro-coxitis may give rise to the formation of pus, which will gather in front of the sacro-iliac articulation. Diagnosis is difficult; pressure upon the anterior and posterior superior spines, a digital rectal examination, and an attempt to draw the two iliac bones toward each other causing sharp pain at the diseased articulation may decide the diagnosis.

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